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Area Reports: International 2013

Africa and the Middle East

Volume III

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Foreword

This edition of the U.S. Geological Survey (USGS) Minerals Yearbook discusses the performance of the worldwide minerals and materials industries during 2013 and provides background information to assist in interpreting that performance. Content of the individual Minerals Yearbook volumes follows:

- Volume I, Metals and Minerals, contains chapters about virtually all metallic and industrial mineral commodities important to the U.S. economy. Chapters on survey methods, summary statistics for domestic nonfuel minerals, and trends in mining and quarrying in the metals and industrial mineral industries in the United States are also included.
- Volume II, Area Reports: Domestic, contains a chapter on the mineral industry of each of the 50 States and Puerto Rico and the Administered Islands. This volume also has chapters on survey methods and summary statistics of domestic nonfuel minerals.
- Volume III, Area Reports: International, is published as four separate reports. These regional reports contain the latest available minerals data on more than 190 foreign countries and discuss the importance of minerals to the economies of these nations and the United States. Each report begins with an overview of the region's mineral industries during the year. It continues with individual country chapters that examine the mining, refining, processing, and use of minerals in each country of the region and how each country's mineral industry relates to U.S. industry. Most chapters include production tables and industry structure tables, information about Government policies and programs that affect the country's mineral industry, and an outlook section.

The USGS continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Minerals Yearbook are welcomed.

Suzette M. Kimball, Director

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Contacts

Information about the U.S. Geological Survey, its programs, staff, and products may be accessed on the Internet at http://www.usgs.gov or by contacting the Earth Science Information Center at 1–888–ASK–USGS. For specific information about this publication, contact the Director, National Minerals Information Center, by mail at U.S. Geological Survey, 12201 Sunrise Valley Drive, 988 National Center, Reston, VA 20192, or by email at nmicrecordsmgt@usgs.gov, or by calling (703) 648–4961. Additional minerals information may be accessed at http://minerals.usgs.gov/minerals/.

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Acknowledgments

The Country Specialists in the National Minerals Information Center, U.S. Geological Survey, in preparing the International Review regional books of volume III of the Minerals Yearbook, extensively use statistics and data on mineral production, consumption, and trade provided by various foreign Government minerals and statistical agencies through various official publications. The cooperation and assistance of these organizations are gratefully acknowledged. Statistical and informational material was also obtained from reports of the U.S. Department of State, United Nations publications, and the domestic and foreign technical and trade press.

Of particular assistance were reports submitted by the Resource Reporting Officers and other officers of the Department of State in U.S. Embassies worldwide. Their contributions are sincerely appreciated. Internal statistical support was provided by the staff of the Data Collection and Coordination Section of the National Minerals Information Center.

The regimes of some countries reviewed in this volume may not be recognized by the U.S. Government. The information contained herein is technical and statistical in nature and is not to be construed as conflicting with or being contradictory of U.S. foreign policy.

The staff of the National Minerals Information Center gratefully acknowledges the invaluable contributions that John H. DeYoung, Jr., has made to the quality of the Minerals Yearbook as Scientist Emeritus at the National Minerals Information Center.

Steven M. Fortier
Director, National Minerals Information Center

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The Mineral Industries of Africa

By Thomas R. Yager, Omayra Bermúdez-Lugo, Philip M. Mobbs,[1]
Harold R. Newman, Mowafa Taib, Glenn J. Wallace, and David R. Wilburn

The 57 independent nations and other territories of continental Africa and adjacent islands covered in this volume encompass a land area of 30.3 million square kilometers, which is more than three times the size of the United States, and were home to 1.11 billion people in 2013. Nigeria had a population of 174 million in 2013; Ethiopia, 94.1 million; Egypt, 82.1 million; the Democratic Republic of the Congo [Congo (Kinshasa)], 67.5 million; and South Africa, 53 million (table 1). For many of these countries, mineral exploration and production constitute significant parts of their economies and remain keys to future economic growth. Africa is richly endowed with mineral reserves and ranks first or second in quantity of world reserves of bauxite, chromite, cobalt, industrial diamond, manganese, phosphate rock, platinum-group metals (PGMs), rutile, soda ash, and zirconium (Bedinger, 2015a, b; Bray, 2015; Corathers, 2015; Dolley, 2015; Jasinski, 2015; Loferski, 2015; Olson, 2015; Papp, 2015; Shedd, 2015).

The mineral industry was an important source of export earnings for many African nations in 2013. To promote exports, groups of African countries have formed numerous trade blocs, which included the Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC), the Economic Community of Central African States (ECCAS), the Economic Community of West African States (ECOWAS), the Mano River Union, the Southern African Development Community (SADC), and the West African Economic and Monetary Union (UEMOA). Algeria, Angola, Libya, and Nigeria were members of the Organization of the Petroleum Exporting Countries (OPEC). The African Union, which had 54 African countries as members, was formed to accelerate socioeconomic integration and promote peace, security, and stability on the continent.

The U.S. Geological Survey (USGS) acknowledges and expresses its sincere appreciation to the following Government agencies, international institutions, and private research organizations for providing mineral production statistics, basic economic data, and mineral exploration and other mineral-related information:

For mineral production statistics—
- •Algeria—Ministry of Energy and Mines,
- •Angola—Ministry of Geology and Mines,
- •Burkina Faso—Ministry of Mines and Energy,
- •Kenya—Ministry of Mining,
- •Malawi—Department of Mines,
- •Mauritius—Statistics Mauritius,
- •Mozambique—National Directorate of Mines,
- •Niger—Ministry of Mines and Industrial Development,
- •Seychelles—Seychelles Energy Commission,
- •South Africa—Department of Mineral Resources,
- •Swaziland—Central Statistical Office,
- •Tanzania—Ministry of Energy and Minerals,
- •Togo—General Directorate of Statistics and National Accounting,
- •Tunisia—National Institute of Statistics, and
- •Zimbabwe—Minerals Marketing Corporation.

For basic economic data—the International Monetary Fund.

For mineral consumption data—
- •BP p.l.c.,
- •International Nickel Study Group,
- •World Bureau of Metal Statistics, and
- •World Steel Association.

For exploration and other mineral-related information—Metals Economics Group (MEG) in Canada.

General Economic Conditions

In 2013, the real gross domestic product (GDP) of Sub-Saharan Africa increased by 5.1%; the GDP increased in Morocco by 4.4%; Algeria, 2.8%; Tunisia, 2.3%; and Egypt 2.1%. Libya's GDP decreased by 13.6% in 2013 (table 2). The worldwide GDP increased by 3.3% in 2013. The average GDP growth rate in Sub-Saharan petroleum-exporting countries was 5.7%; in low-income petroleum-importing countries, 6.1%; and in middle-income petroleum importing countries, 3.5%. In Sierra Leone, the GDP increased by 20.1% in 2013, mainly because of increased iron ore production. South Sudan's GDP increased by 27.1% in 2013 because of the resumption of crude petroleum production in April. In Libya, the decrease in the GDP was attributable to disruptions to crude petroleum production (International Monetary Fund, 2014, p. 65, 184, 189–190).

GDP growth in African petroleum-exporting countries is projected to be at or about 5.1% in 2014 and 5.8% in 2015. In low-income petroleum-importing countries, GDP growth is expected to be at or about 6.3% in 2014 and 6.6% in 2015. GDP growth is likely to be at or about 3% in 2014 and 3.6% in 2015 in middle-income petroleum-importing countries. South Sudan's GDP is expected to decrease by 12.3% in 2014 because of disruptions to petroleum production resulting from the civil war that started in December 2013 (International Monetary Fund, 2014, p. 65, 190).

Investment Data

In South Africa, numerous producers are planning new mines and plants and capacity expansions of existing operations for andalusite, cement, chromite, coal, diamond, ferrochromium, ferromanganese, ferrovanadium, fluorspar, gold, iron ore, manganese ore, pig iron, phosphate fertilizers, PGMs, rare-earth elements, silicomanganese, titanium metal, uranium, vanadium, zinc, and zirconium metal. In 2013, the estimated costs of newly committed mineral projects was $18.7 billion, of which PGM

[1]Deceased.

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projects accounted for 38.3%; processed minerals, 17.8%; gold, 4.2%; and other unprocessed minerals, 39.7% (Mwape and others, 2015, p. 33).

In Tanzania, the estimated capital cost of a proposed liquified natural gas project was between $10 billion and $16 billion. For the Kamoa copper project in Congo (Kinshasa), capital costs in the first phase of the project were estimated to be $1.4 billion, and in the second phase, an additional $3.5 billion. The estimated capital cost of the Zambeze coal project in Mozambique was $3.3 billion. A proposed petroleum refinery in Uganda had an estimated cost of $2.5 billion (Brower, 2013; Engineering & Mining Journal, 2013; Northern Miner, The, 2013; Quinlan, 2013).

Legislation

In July 2010, the U.S. Congress passed the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act), which contains provisions concerning the use of minerals to finance armed groups in eastern Congo (Kinshasa). The U.S. Securities and Exchange Commission (SEC) issued regulations in final form in accordance with the Dodd-Frank Act in August 2012 (U.S. Securities and Exchange Commission, 2012, p. 56274–56275).

Under the regulations, all companies registered with the SEC that sell products containing gold, tantalum, tin, or tungsten are required to disclose whether these minerals originated from Congo (Kinshasa) or adjoining countries. Companies that sell products containing gold, tantalum, tin, or tungsten that originated in Congo (Kinshasa) or adjoining countries are also required to submit annual reports to the SEC describing the due diligence measures taken to determine the source and custody of such minerals and to provide a description of the products manufactured or contracted to be manufactured that are not conflict-free. The reports also are required to be published on the companies' Web sites (U.S. Securities and Exchange Commission, 2012, p. 56274).

In December 2010, the Government of Rwanda and the International Tin Research Institute Ltd. (ITRI) started the ITRI Tin Supply Chain Initiative (iTSCI) certification scheme for domestically produced tantalum, tin, and tungsten to meet end users' requirements of the Dodd-Frank Act. By the end of 2013, 224 mining companies that operated 638 mine sites were participating in the iTSCI. In July 2013, ITRI started a mineral-sampling program at numerous mine sites; 324 out of the planned 480 samples were collected by yearend (International Tin Research Institute, Ltd., 2014b).

In March 2011, the government of Katanga, which is a Province of Congo (Kinshasa), and ITRI started the implementation of iTSCI in the Province. By the end of 2012, 140 mine sites were covered by the scheme in Katanga Province. By the end of 2013, the iTSCI program had been implemented in 27 subsectors in the Kailo Territory and the Pangi Territory in Maniema Province. In December, a feasibility study on expanding the program to Punia Territory in Maniema Province was completed with favorable results. The program was expected to commence in Punia Territory in January 2014 (International Tin Research Institute, Ltd., 2013, 2014a).

In 2013, the Government of Burundi was engaged in a pilot program to implement a system established by the International Conference on the Great Lakes Region (ICGLR) to certify and trace domestically mined cassiterite, columbite-tantalite, and gold because of the conflict minerals issue in Congo (Kinshasa) (Levin and Cook, 2013, p. 18).

In 2013, the Government of Congo (Kinshasa) was considering a new mining code that would increase its free-carried and nondilutable share in mining projects to 35% from 5%. The proposed mining code would increase royalty rates on precious metals to 6% from 2.5%, and on nonferrous metals, to 6% from 2%. Exploration permits would be reduced to 6 years from 15 years. The proposed mining code would not be submitted for approval by the Congolese Parliament before the first quarter of 2014 (Engineering & Mining Journal, 2014).

In April 2013, the Government of Congo (Kinshasa) issued a decree that banned the export of cobalt and copper concentrates. Companies were given a 90-day moratorium to comply with the ban; the moratorium subsequently was extended until yearend (Engineering & Mining Journal, 2014).

In October 2013, the Government of Burundi passed the Mining Code of Burundi (Law No. 1/21 of October 15, 2013), which partially replaced the Mining and Petroleum Act of 1976 (Decree-Law No. 1/138 of July 17, 1976). The exploration for and mining of minerals and mineral fuels other than petroleum and natural gas were governed by the Mining Code of Burundi. At yearend, the natural gas and petroleum subsector still was governed by the Mining and Petroleum Act of 1976 (Karerwa, 2013).

Burundi's Mining Code set *ad valorem* royalty rates on mining companies with exploitation licenses at 7% for gemstones, 5% for precious metals, 4% for basic metals, and 2% for other minerals. *Ad valorem* royalty rates on quarries, artisanal miners, and authorized mineral traders were set at 3% for base metals, 2% for precious metals, 2% for gemstones, and 1.5% for other minerals (Karerwa, 2013).

The Mining Code also required a simplified environmental impact study to be conducted for prospecting, exploration, artisanal mining, and quarrying licenses to be awarded and a full environmental impact study for exploitation licenses to be awarded. Companies holding exploitation licenses were also required to allow the Government to hold at least a 10% share in their Burundian operations (Karerwa, 2013).

The Government attempted to formalize the artisanal mining sector in Burundi by mandating in the Mining Code that all artisanal miners have a mining license. In March 2013, the Government also imposed a 2-month mining ban on artisanal mining in an attempt to formalize the artisanal mining sector (United Nations Group of Experts, 2013, p. 35; U.S. Embassy, Bujumbura, Burundi, 2014).

The petroleum and natural gas subsector of Uganda was governed by the Petroleum (Exploration, Development, and Production) Bill 2012 (the Upstream Act) and the Petroleum (Refining, Gas Processing, Transportation, and Storage) Act 2012 (the Midstream Act). The Upstream Act and the Midstream Act, which replaced the Petroleum (Exploration and Production) Act of 1985, were enacted into law in March 2013 and July 2013, respectively. The laws established a competitive bidding process for licenses in the upstream natural gas and petroleum subsector, the Petroleum Authority to advise

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the Government and implement its regulations, and a national oil company to manage the Government's commercial interests in natural gas and petroleum. Production-sharing agreements would have a Government interest of between 15% and 20% (Mosbacher, 2013; Wass and Musiime, 2013, p. 17–18).

Unlike many other countries, the Government of Guinea amended its mining code to reduce some taxes in order to improve its investment climate. Mining profit taxes on most mineral commodities were reduced to 30% from 35%, and the tax on bauxite was reduced to 0.15% from 0.55% of the international price for aluminum (Thomson Reuters, 2013).

In May 2012, Ethiopian production of columbite-tantalite was suspended because of Government plans to stop exporting unprocessed concentrates and to focus on building a new plant for downstream processing. The Government lifted the ban on concentrate exports in 2013 (Araya, 2013).

In August 2013, the Government of Kenya canceled all exploration, mining, and prospecting licenses issued between January 15, 2013, and May 15, 2013, because the licenses reportedly were issued without proper documentation. A total of 43 licenses were revoked. The Government also increased royalty rates on niobium, rare earths, and titanium minerals to 10% from 3%; on coal, to 8% from 4%; and on gold, to 5% from 2.5% (Jiwaji, 2013; Metal Bulletin, 2013; Kushner, 2014).

The Government of Zimbabwe approved a policy banning alluvial mining near bodies of water and canceled all existing exploration permits in these areas. Local governments will be responsible for ensuring compliance with the Government's ban (Hall, 2014). The Government also announced plans to ban exports of raw platinum. The metal is currently shipped for refining in South Africa (Njanji 2014).

In Tanzania, large foreign mining companies will need to procure at least 80% of goods and services from local businesses by 2015. The Government of Namibia placed a moratorium on planned marine phosphate mining off the coast of Namibia until an environmental impact assessment was performed and demonstrated that mining would not harm the country's fishing industry (Ernst & Young Global Ltd., 2013, p. 3; Kaira, 2013).

Exploration

Exploration activity, as defined by African exploration budgets reported by SNL Metals & Mining (SNL), decreased to about $2.4 billion in 2013 from about $3.4 billion in 2012 (SNL Metals Economic Group, 2013). Based on site data compiled by the USGS, active gold and silver projects in 2013 accounted for approximately 48% of the reported African exploration projects; base metals, about 16%; iron ore, about 12%; PGMs, about 6%; diamond and uranium, about 4% each; and other minerals, about 10%. Early-stage exploration projects accounted for about 70% of the 2013 activity; producing projects, about 16%; feasibility-stage projects, about 11%; and developing projects, about 3%.

African exploration activity, expressed in terms of the number of active sites, decreased to 331 sites in 2013 from 471 sites in 2012. Exploration was focused primarily in, in descending order based on the number of sites, South Africa (60 sites), Burkina Faso (28 sites), Congo (Kinshasa) (26 sites), Ghana (21 sites), Tanzania (20 sites), Mali and Namibia (18 sites each), Zambia (16 sites), Ivory Coast (11 sites), and Guinea and Sierra Leone (10 sites each). Activity also took place at 93 sites in 22 other countries. Table 3 highlights exploration information for 18 selected sites.

Exploration activity in Africa in 2013 varied as recent discoveries and improved investor interest stimulated activity in some areas, whereas factors that affect mineral supply, such as labor issues and regional unrest, limited interest and activities in other areas. The level of investor interest was also affected by the amount and cost of infrastructure in some areas. Issues of concern included artisanal mining, conflict minerals, employment, Government pressures, and political instability (Hall, 2012). For example, ongoing conflict in Sudan and South Sudan restricted mineral exploration activity. Also, mining-related tax increases were implemented or proposed in Congo (Kinshasa), Ghana, and Mozambique, and a new mining code was approved in Burundi in 2013 (Ernst & Young Global Ltd., 2013).

Interest in exploring for African mineral resources continued at a reduced level as exploration companies of all sizes reduced their exploration budgets in 2013. The limited amount of financing available forced many junior companies to limit their focus on selected projects. In spite of these issues, a survey of institutional investors conducted by the Economist Intelligence Group Ltd. found that two-thirds of the respondents listed Africa as having the greatest opportunity for investment of global frontier markets in spite of its macroeconomic and political risk (Economist Intelligence Group Ltd., 2012, p. 7).

Commodity Overview

In tables 5 through 20, estimates for the production of major mineral commodities for 2016 and beyond have been based upon supply-side assumptions, such as announced plans for increased production, new capacity construction, and bankable feasibility studies. The outlook tables in this summary chapter show historic and projected production trends; therefore, no indication is made about whether the historic data are estimated or reported, and revisions are not identified. Data on individual mineral commodities in tables in the individual country chapters are labeled to indicate estimates and revisions. The outlook segments of the mineral commodity tables are based on projected trends that could affect current (2013) producing facilities and on planned new facilities that operating companies, consortia, or Governments have projected to come online within indicated time frames. Forward-looking information, which includes estimates of future production, exploration and mine development, cost of capital projects, and timing of the start of operations, are subject to a variety of risks and uncertainties that could cause actual events or results to differ significantly from expected outcomes. Projects listed in the following section are presented as an indication of industry plans and are not a USGS prediction of what will take place.

Metals

Aluminum and Bauxite and Alumina.—*Production.*—African bauxite production increased by about 5% in 2013

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compared with that of 2012. In 2013, increased output at the Sangaredi Mine more than offset the closure of the Friguia Mine in Guinea. In Ghana, production increased at the Awaso Mine. Output decreased at the Sierra Minerals Mine in Sierra Leone. Guinea accounted for about 92% of African bauxite production in 2013; Ghana, more than 4%; and Sierra Leone, about 3% (table 5). In 2013, Africa's share of world bauxite production was 7% (table 4).

African production of refined aluminum increased by more than 8% in 2013. Increased production at the Hillside smelter in South Africa more than offset decreased production from the Ikot Abasi smelter in Nigeria. Output also increased in Cameroon. South Africa accounted for about 40% of African aluminum output in 2013; Mozambique, 28%; and Egypt, 26% (table 6). Africa accounted for 4% of the world's aluminum production in 2013 (table 4).

Consumption.—In 2013, world primary refined aluminum consumption increased to 46.6 million metric tons (Mt) from 45.6 Mt in 2012. Africa's primary refined aluminum consumption decreased to 836,900 metric tons (t) in 2013 from 900,400 t in 2012 (Metal Bulletin, 2014a, b).

Outlook.—African bauxite production is likely to increase by an average of about 18% per year from 2013 to 2020. Most of the increase would be attributable to Guinea, where the Dian-Dian and the F.A.R. projects were expected to start in 2016, and the GAC Mine, by 2018. Output from the Sierra Minerals Mine in Sierra Leone also could increase by 2016 (table 5).

The production of refined aluminum is expected to decrease by 6% by 2016 and subsequently to remain unchanged until at least 2020. Output is likely to decrease in South Africa with the closure of the Bayside smelter (table 6).

Cobalt.—*Production.*—In 2013, African cobalt mine production increased by about 15% compared with that of 2012. Increased production in Congo (Kinshasa) was mostly attributable to the Mutanda and the Tenke Fungurume Mines. Production increased at the Ambatovy nickel-cobalt mine in Madagascar and at the Nkomati Mine in South Africa. In 2013, Congo (Kinshasa) accounted for 83% of African cobalt mine production; Zambia, 7%; and South Africa, 4% (table 7). Africa's share of world cobalt mine production was 63% in 2013 (table 4).

Outlook.—African cobalt mine production is expected to increase by an average of 4% per year from 2013 to 2020. Congo (Kinshasa) is likely to account for most of the increase in output because of the expansion of the Etoile, the KOV, the KTO, and the Mutanda Mines. Production is expected to increase at the Tenke Fungurume Mine and to decrease at the Mukondo Mountain Mine. In Madagascar, the Ambatovy Mine and refinery planned to reach 90% of capacity in 2016. In Burundi, the Musongati nickel mine could start production in 2015 and reach full capacity by 2020. Output is also likely to increase in South Africa and Zambia (table 7).

Copper.—*Production.*—Africa's copper mine production increased by nearly 27% in 2013 compared with that of 2012. In 2013, Congo (Kinshasa) accounted for nearly 50% of African copper mine production; Zambia, 39%; and South Africa, 4% (table 8). Africa's share of world copper mine production was 11% in 2013 (table 4). The production increase in Congo (Kinshasa) was attributable to increased output at numerous mines, including the Dikulushi, the Kinsevere, the Kipoi, the KOV, the KTO, the Mutanda, the Mukondo Mountain, the T17, and the Tenke Fungurume Mines. Mining restarted at the Frontier Mine in 2013. In Zambia, output increased at the Kansanshi, the Lubambe, and the Nkana Mines. In Botswana, increased production at the Boseto and the Thakudu Mines more than offset decreased production from the Phoenix Mine. Mining from a copper-rich zone at the Bisha Mine in Eritrea started in 2013. In South Africa, output decreased at the Palabora Mine.

In 2013, Congo (Kinshasa) accounted for 51% of African refined copper production; Zambia, 42%; and South Africa, 6% (table 9). In Congo (Kinshasa), production increased at the Kinsevere, the Luilu, the Luita, the Mutanda, and the Tenke Fungurume solvent extraction/electrowinning plants. Output also increased in South Africa and Zambia. Egypt was the only producer of secondary refined copper in Africa; primary production accounted for most African production.

Consumption.—In 2013, world refined copper consumption increased to 21.3 Mt from nearly 20.1 Mt in 2012. Africa's refined copper consumption increased to 247,000 t in 2013 from 244,900 t in 2012 (Karpel, 2014; Pinkham, 2015).

Outlook.—African copper mine production is expected to increase by an average of about 6% per year from 2013 to 2020. Zambia's output is likely to nearly double because of increased output from the Kansanshi, the Konkola, and Lubambe Mines and the opening of the Sentinel Mine. In Congo (Kinshasa), expansions were planned at the Etoile Mine by 2016, and at the KOV, the KTO, and the T17 Mines, from 2013 to 2020. Other contributions to increased national production of mined copper would include the opening of the Kapulo and the Kamoa Mines in 2015 and 2019, respectively, and increased output from the Mutanda Mines (table 8).

Mining from a copper-rich zone at the Bisha Mine in Eritrea was planned from 2014 to mid-2016. The Asmara North project is also likely to contribute to copper production in Eritrea starting in 2016. South Africa's production of mined copper is expected to increase because of the Lift II project at the Palabora Mine starting in 2016 and expansions at PGM mines. In Uganda, the reopening of the Kilembe Mine is planned for 2015. Copper mine production is also likely to increase in Botswana as the closure of the Boseto Mine in 2015 is more than offset by the opening of the Ghanzi project in 2017 or 2018 (table 8).

The production of refined copper is expected to increase by an average of between 4% and 5% per year from 2013 to 2020. In Congo (Kinshasa), production is likely to increase at the Luilu plant between 2013 and 2018. The expansion of the Usoke Avenue plant is planned to be completed in 2016. The opening of a new plant at the Kipoi Mine is planned for 2014. Congo (Kinshasa), which did not produce refined copper in 2005, could account for 60% of the continent's refined copper output by 2020. South Africa's production of refined copper is expected to increase because of the Lift II project at the Palabora Mine starting in 2016. In Namibia, the Tschudi project was planned to start production by 2016. Zambia's output is also likely to increase (table 9).

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Gold.—*Production.*—Africa's gold mine production was about 531,000 kilograms in 2013, which was a decrease of about 1% compared with that of 2012. Production was nearly unchanged from 2005 because the long-term decline in South African production was offset by the increased output in Burkina Faso, Ethiopia, Ghana, Sudan, Togo, and other countries (table 10). In 2013, Africa's share of world gold mine production was about 19% (table 4).

In 2013, South Africa accounted for 30% of African gold production; Ghana, 17%; Mali and Tanzania, 8% each; Burkina Faso, 6%; and Sudan, 5%. South Africa's share of continental gold production decreased to 30% from 56% in 2005 because of rising production costs associated with deeper underground operations and increased production in other countries (table 10).

The increase in South Africa's production was attributable to numerous mines in 2013, including the Beatrix, the Cooke, the Driefontein, the Kloof, the Kopanang, the Moab Khotsong, and the Tau Tona Mines. Production decreased at the Kusasalethu, the Mponeng, the Phakisa, and the Tau Lekoa Mines and shut down at the Blyvoor and the Buffelsfontein Mines. In Tanzania, increased output from artisanal miners and the Buzwagi, the New Luika, and the North Mara Mines more than offset decreased output from the Bulyanhulu, the Geita, the Golden Pride, and the Tulawaka Mines. The Kibali and the Namoya Mines started operations in Congo (Kinshasa) in 2013. The increase in Burkina Faso's production was attributable to the opening of the Bissa Mine. In Mauritania, output increased at the Tasiast Mine. Production also increased at the Sukari Mine in Egypt (table 10).

Production by Sudanese artisanal gold miners decreased sharply in 2013. Artisanal gold mining also decreased in Kenya. In Eritrea, production decreased at the large-scale Bisha Mine in Eritrea. Output also decreased at large-scale mines in Botswana, Namibia, and Niger (table 10).

Outlook.—Gold mine production in Africa is expected to increase by an average of between 3% and 4% per year from 2013 to 2020. The increase is likely to be primarily attributable to countries in West Africa. In Ghana, the outlook is for an increase in output because of the rampup of the Akyem Mine in 2014, the expansion of the Ahafo Mine by 2017, and the opening of the Konongo Mine and the Wa Gold project by 2018. Production could start to decrease in 2020 because of the depletion of the Damang Mine. Côte d'Ivoire's production is likely to more than double because of the expansions of the Ity Mine by the end of 2017 and the opening of the Agabou Mine in 2014 and the Yaoure Mine in 2018 (table 10).

Gold production is also expected to increase in other West African countries, including Burkina Faso, Guinea, and Senegal. Burkina Faso's production is likely to increase because of the expansion of the Essakane and the Mana Mines between 2014 and 2020 and the opening of the Hounde project by 2018. Guinea's production is likely to increase because of the expansion of the Lefa and the Siguiri Mines by 2016 and the startup of the Kourousa and the Tri-K projects by 2018. The outlook for Senegal is for increased output because of the opening of the OJVG and the Masawa Mines in 2014 and 2020, respectively, which would more than offset the depletion of the Sabodala Mine by 2018 (table 10).

In eastern Africa, Tanzania's production is likely to increase until 2017 and to begin to decrease subsequently. Increased output would be attributable to the expansions of the Bulyanhulu and the North Mara Mines in 2014 and 2015, respectively. The opening of the Buckreef Mine is expected to take place in 2015, and the Singida Mine, in 2018. The closures of the Golden Pride Mine in 2013, the Tulawaka Mines in 2017, and the Buzwagi Mine in 2019 would result in decreased production after 2017. In Ethiopia, increased production is likely to be attributable to the opening of the Tulu Kapi Mine in 2016 and the Jilay Mine in 2017. The depletion of the gold-rich zones in the Bisha Mine in Eritrea is expected to be offset by the start of production at the Koka Mine and the Asmara North project in 2015 and 2016, respectively. Output in Congo (Kinshasa) is likely to more than double because of the commissioning of the Namoya Mines in 2014 and increased output at the Kibali and the Twangiza Mines (table 10).

In southern Africa, the upward trend in South Africa's production is expected to continue between 2014 and 2018. The expansions of the Doornkop, the Kusasalethu, and the Phakisa Mines could be completed by 2018. Output at the South Deep Mine could increase between 2014 and 2022. The reopening of the Burnstone Mine and the startup of the West Rand Tailings Retreatment Project are planned for 2015. Output at the Beatrix, the Driefontein, and the Kloof Mines is likely to increase through 2017 and to decline subsequently. Namibia's output is likely to increase because of the opening of the Otjikoto Mine in late 2014. Gold production could also increase in Zambia and Zimbabwe (table 10).

In northern Africa, the increased output from artisanal miners, the opening of a new mine at Wadi Gabgaba by 2015, and the expansion of the Hassai Mine by 2020 are expected to more than double Sudan's gold production. In Egypt, production is likely to increase at the Sukari Mine by 2016 (table 10).

Several African countries that had only artisanal gold production in 2013 are likely to open large-scale gold mines in the near future. The opening of the New Liberty and the Dugbe 1 projects in Liberia were planned for 2015 and 2016, respectively. Other new mines opening include the Fair Bride Mine in Mozambique by 2017 and the Passendro Mine in the Central African Republic and the Boamahun Mines in Sierra Leone by 2018 (table 10).

Iron and Steel.—*Production.*—African production of crude steel increased by about 5% in 2013 compared with that of 2012. Output increased in Egypt, Libya, and South Africa and decreased in Algeria. In 2013, South Africa accounted for 43% of regional crude steel production; Egypt, 40%; Libya, 4%; and Algeria and Morocco, 3% each (table 12). Africa's share of world crude steel production amounted to 1% in 2013 (table 4).

Consumption.—In 2013, world crude steel consumption increased to nearly 1.65 billion metric tons (Gt) from 1.55 Gt in 2012. African crude steel consumption increased to 36.8 Mt in 2013 from 33.1 Mt in 2012. Egypt accounted for 22% of African crude steel consumption; Algeria and South Africa, 17% each; Nigeria, 7%; Morocco and Libya, 5% each; and Kenya, 4% (World Steel Association Committee on Economic Studies, 2014a, p. 80–81).

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Outlook.—Crude steel production is expected to increase by about 11% per year from 2013 to 2020. The restart of a new plant in Cape Town in 2013 and the addition of 5.6 million metric tons per year of new capacity by 2019 is expected to substantially increase South African production. Algeria's share of African steel output is likely to increase to 11% in 2020 from 3% in 2013 with the opening of a new plant at Bellara. In Egypt, several companies, including Egyptian Steel Group, planned to expand capacity. In Uganda, the Sukulu phosphate and iron ore project was likely to start producing steel in late 2016. The opening of the Liganga iron ore mine and its associated steel plant in Tanzania was planned for 2018. In Ethiopia, the Toussa plant is planned to start production by 2016. Output is also expected to increase in Libya, Tunisia, and Zambia (table 12).

Iron Ore.—*Production.*—In 2013, the iron content of ore produced in Africa was 68.6 Mt compared with 58.1 Mt in 2012. Increased production in South Africa was attributable to the Khumani, the Kolomela, the Mapochs, and the Palabora Mines; output decreased at the Sishen Mine. Output increased at the Western Range project in Liberia in 2013. In Sierra Leone, production increased at the Marampa and the Tonkolili Mines. Production also increased in Swaziland. South Africa was the leading iron ore producer in Africa and accounted for 62% of continental output; Sierra Leone, 17%; Mauritania, 12%; and Liberia, 4%. In 2010, Liberia and Sierra Leone did not mine iron ore (table 11).

Outlook.—The iron content of ore produced in Africa is expected to increase to about 180 Mt in 2020. Most of the increase is likely to be attributable to countries in West Africa. In Guinea, the planned opening of the Nimba project was in early 2016. Production from the Kalia Mine could start in 2015; the new mines in Blocks 3 and 4 near Simandou and the Nimba project, by 2018; and the new mines in Blocks 1 and 2 near Simandou and the Zogota Mine, by 2020. In Liberia, production is likely to increase because of the expansion of the Western Range project by 2018 and the openings of the Bong Mine and the Putu Range project in 2014 and 2017, respectively. In Sierra Leone, the Marampa and the Tonkolili Mines could reach full capacity by 2020 after a temporary shutdown in 2014. Iron ore production could start at the Agbaja project in Nigeria in 2018 and at the Kango Mine in Gabon in 2019 (table 11).

Iron ore production is also likely to increase in North Africa countries. Mauritania's output is expected to nearly double because of the expansions of the Guelb el Rhein, the Kedia d'Idjill, and the M'Haoudat Mines and the startup of the Guelb El Aouj Mine and other projects. In Algeria, the opening of a new mine at Gara Djebilet by 2016 is likely to increase national iron ore production (table 11).

In South Africa, increased production at the Kolomela and the Sishen Mines is planned for 2017. New mines are expected at the Bushveld Vanadium and the Ironveld Pig Iron projects by 2018 and 2019, respectively. Iron ore mining is likely to start at the Tete project in Mozambique in 2016 and at the Liganga Mine in Tanzania in 2018. Iron ore production from saprolite ore at the Musongati nickel mine in Burundi could start in 2015. In Uganda, mining at the Sukulu phosphate and iron ore project was likely to start in late 2016 (table 11).

Guinea, Liberia, and Sierra Leone did not produce iron ore in 2010; their shares of African iron ore production by 2020 are expected to be 35%, 12%, and 8%, respectively. South Africa's share is likely to decline to 30% from 62% in 2013 in spite of a substantial increase in domestic production (table 11).

Nickel.—*Production.*—African nickel mine production increased by about 43% from 2012 to 2013. In South Africa, output increased at the Nkomati Mine and PGM mining operations. Production increased at the Ambatovy Mine in Madagascar. In Botswana, increased output from the Selebi-Phikwe Mines more than offset decreased output from the Phoenix Mine. Nickel mining also increased in Zimbabwe. South Africa accounted for 44% of African nickel mine production in 2013; Madagascar, 23%; Botswana, 20%; and Zimbabwe, 12% (table 13).

Consumption.—In 2013, world primary refined nickel consumption increased to 1.78 Mt from nearly 1.67 Mt in 2012. Africa's primary refined nickel consumption decreased to 22,900 t in 2013 from 24,600 t in 2012 (International Nickel Study Group, 2015).

Outlook.—Nickel mine production is expected to increase by an average of about 11% per year from 2013 to 2020. In South Africa, nickel production is likely to increase at existing PGM mining operations and to start at new PGM mining operations, including the Bakubung, the Platreef, the Waterberg, and the Western Bushveld projects. In Madagascar, the Ambatovy Mine and refinery were planned to reach 90% of capacity in 2016. The Enterprise Mine in Zambia could open by 2018. In Burundi, the Musongati nickel mine could start production in 2015 and reach full capacity by 2020. By 2020, Madagascar and Zambia could increase their shares of African nickel mine production to 26% and 17%, respectively (table 13).

Platinum-Group Metals.—*Production.*—From 2012 to 2013, Africa's production of platinum and palladium increased by 8% and 3%, respectively. In South Africa, increased palladium and platinum production in 2013 was attributable to the Bokoni, the Eland, the Impala, the Kroondal, the Marikana, the Mogalakwena, the Nkomati, the Pilanesburg, the Two Rivers, and the Western Limb Mines. The Booysendal and the Tharisa Mines started in 2013. Output decreased at the Batholope, the Khomanani, the Thembelani, and the Union Mines in 2013; the Crocodile River Mine shut down operations. PGM production also increased in Zimbabwe. Decreased production in Botswana was attributable to the Phoenix Mine. South Africa, which was the continent's dominant producer of PGMs, accounted for 91% and 87% of the production of platinum and palladium, respectively, in 2013 (tables 14, 15).

Outlook.—African mine production of palladium is expected to increase by an average of between 6% and 7% per year from 2013 to 2020, and mine production of platinum, between 4% and 5% per year. In South Africa, the expansion at the Eland Mine is likely to be completed by 2018; the Impala and the Marula Mines, by 2019; and the Bokoni and the Twickenham Mines, by 2020. Increased output is also expected from the Booysendal, the Mogalakwena, the Pilanesberg, and the Tharisa Mines. The opening of the Western Bushveld Joint Venture is planned for 2015; the Styldrift Mine, for 2017; the Waterberg and the Bakubung Mines, for 2018; and the Platreef project, for 2019.

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In Burundi, the Musongati nickel mine could start producing palladium and platinum in 2015 and reach full capacity by 2020. Output in Zimbabwe could also increase by 2018. In Botswana, production is likely to decrease at the Tati Mine (tables 14, 15).

Tin.—*Production.*—In 2013, African tin mine production decreased by about 11% compared with that of 2012. Output decreased at artisanal and small-scale mining operations in Burundi and Congo (Kinshasa). Rwanda's production increased as new mining companies started operations. Mining restarted in Uganda. In 2013, Congo (Kinshasa) accounted for 49% of African tin mine production; Rwanda, 41%; and Nigeria, 8% (table 16).

Africa did not produce refined tin in 2013 (table 17). Reported production of tin metal ceased in Nigeria and Rwanda in 2005 and 2006, respectively.

Outlook.—Tin mine production is expected to increase by an average of between 22% and 23% per year from 2013 to 2020 (table 16). In Congo (Kinshasa), the first and second phases of the Bisie project are planned for 2017 and 2020, respectively. Tin mining is likely to start in Morocco by 2016 with the opening of the Achmmach and Bou El Jaj projects. In Egypt, the Abu Dabbab tantalum and tin project also is expected to start by 2016. The Rwandan Government planned to more than double total production of niobium (columbium), tantalum, tin, and tungsten by 2017.

By 2020, total African refined tin production is expected to reach more than 13,000 t, of which 83% would be produced in Congo (Kinshasa) and 17% in Rwanda. In Congo (Kinshasa), new plants are expected to open in Lubumbashi and Bisie by 2015 and 2020, respectively. Rwanda's production is expected to restart in 2015 with the reopening of a plant at Karuruma (table 17).

Industrial Minerals

Diamond.—*Production.*—In 2013, Africa's share of world diamond production, by volume, was 55% (table 4). African diamond production decreased by about 2% in 2013 compared with that of 2012. In Congo (Kinshasa), large-scale diamond mines at Mbuji-Mayi and artisanal diamond miners decreased their output. In Zimbabwe, output decreased at the Marenge diamond fields. Artisanal diamond output also decreased in Ghana and Guinea (table 18).

In Botswana, production increased at the Damtshaa, the Jwaneng, the Karowe, and the Orapa Mines. South Africa's production increased because of the Cullinan, the Kimberley Underground, and the Koffiefontein Mines. Production by artisanal miners increased in Sierra Leone. Output also increased in Angola and Namibia.

Botswana accounted for 32% of African diamond output by volume; Congo (Kinshasa), 25%; Zimbabwe, 14%; Angola, 13%; South Africa, 11%; and Namibia, 2%. Large-scale mining operations were predominant in Angola, Botswana, Lesotho, Namibia, and South Africa (table 18).

In 2013, the global value of rough diamond production amounted to $14.1 billion, of which Africa accounted for more than 58%. Botswana accounted for 26% of the value of global rough diamond output; Namibia, 10%; Angola, 9%; South Africa, 8%; Zimbabwe, 4%; and Congo (Kinshasa), 1% (Janse, 2014).

The Kimberley Process Certification Scheme (KPCS) was established in 2003 to reduce the trade in conflict diamond, particularly diamond originating from Angola, Congo (Kinshasa), and Sierra Leone. The establishment of the KPCS involved Government officials from 80 countries that produced, processed, and imported diamond as well as representatives from the European Union, the World Diamond Council, and nongovernmental organizations. As of early August 2013, the following African countries had met the minimum requirements of the KPCS—Angola, Botswana, Cameroon, Central African Republic, Congo (Brazzaville), Congo (Kinshasa), Ghana, Guinea, Lesotho, Liberia, Mauritius, Namibia, Sierra Leone, South Africa, Tanzania, Togo, and Zimbabwe (Kimberley Process, 2013).

In December 2005, the United Nations Security Council banned the importation of rough diamond from Côte d'Ivoire because of the alleged link between illegal diamond mining and the country's unresolved armed conflict. In April 2013, through Resolution 2101 (2013), the United Nations Security Council decided to renew until April 30, 2014, the measures in place to prevent any country from importing rough diamond from Côte d'Ivoire (United Nations Security Council, 2005; 2012; 2013, p. 39, 43).

A ban was placed on diamond exports from the Central African Republic by Kimberley Process (KP) members in May 2013 after a takeover of the Government by rebel forces prevented KP monitors from verifying diamond certification (Penney, 2013).

Outlook.—The production of rough diamond in Africa is expected to increase by an average of 1% per year from 2013 to 2020, with output increasing by more than 500,000 carats per year each in Angola, Botswana, Congo (Kinshasa), and South Africa. In Angola, the Government planned to increase production by 5% per year between 2014 and 2017. Botswana's output is likely to increase because of the expansion of the Oropa Mine and the opening of the Ghaghoo Mine in 2014 and the reopening of the Lerala Mine in 2015. Large-scale diamond mining is expected to increase at Tshibwe in Congo (Kinshasa). In South Africa, the expansions of the Kimberley Underground and the Koffiefontein Mines in 2016, the Finsch Mine in 2017, and the Cullinan Mine in 2019 would contribute to increased production (table 18).

Diamond production is also expected to increase in other African countries. Increased output in Guinea would be attributable to the opening of the Baoule Mine in 2015. By 2018, the Akwatia Mine in Ghana and the Kono Mine in Sierra Leone are expected to be in production. In Tanzania, the expansion at the Williamson Mine is likely to be completed by 2017. Production is also likely to increase in Lesotho and Namibia (table 18).

In Zimbabwe, mining at Marenge is expected to continue to decrease. By 2020, Zimbabwean diamond output is likely to decrease by between 40% and 45% and to more than offset increased output in other African countries (table 18).

Lithium.—*Production.*—Zimbabwe was Africa's only producer of lithium minerals. In 2013, production at the Bikita Mine decreased by about 6% (table 19).

Outlook.—Lithium mineral production at the Bikita Mine is likely to remain stable between 2013 and 2020 (table 19).

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Mineral Fuels and Related Materials

Coal.—*Production.*—African coal production remained nearly unchanged in 2013. Decreased output in South Africa was offset by increased output in Mozambique and Zimbabwe. In South Africa, production decreased at numerous mines including the Impunzi, the Inyanda, the Koornfontein, and the Optimum Mines; mining shut down at Mooiplaats and Vuna in 2013. The increase in Mozambique's production was attributable to the Benga, the Chirodze, and the Moatize Mines. Output also increased at the Morupule Mine in Botswana and the Entuba Coalfields in Zimbabwe. South Africa, which was the dominant coal producer in Africa, accounted for 95% of regional coal output, and Mozambique and Zimbabwe, 2% each (table 20). About 99% of South Africa's coal production was bituminous. Africa accounted for about 4% of the world's total anthracite and bituminous coal production in 2013 (table 4).

Consumption.—Africa accounted for about 2.5% of world coal consumption in 2013. Within the region, South Africa accounted for 92% of African coal consumption. From 2008 to 2013, Africa's consumption of coal decreased by about 9% (BP p.l.c., 2014, p. 33).

Outlook.—African coal production is expected to increase by nearly 6% per year from 2013 to 2020. South Africa is likely to be responsible for the majority of the increase; its production could increase to 330 Mt by 2020 (table 20). The opening of the Argent Mine is planned by 2015, the Boikarabelo, the Nooitgedacht, and the Zonnebloem Mines, by 2016; the Belfast, the De Wittekrans and the Klippoortjie Mines, by 2017; the Brakfontein, the Makhado, and the Thabametsi Mines, by 2018; the Berenice Cygnus and the Springboklaagte Mines, by 2019; and the Schoonoord Mine, by 2020. The expansion at the Tweefontein Mine is likely by 2015; the Koorfontein Mine, by 2019; and the Goedgevonden Mine, by 2020. The Grootegeluk Mine is expected to ramp up to full capacity by 2018.

Mozambique was the second-ranked coal producer in Africa in 2013. The expansion of the Benga and Moatize Mines is expected to be complete by 2017, and the Chirodze Mine, by 2020. The Ncondezi and the Revuboe Mines are also likely to start up by 2016.

In Tanzania, the opening of the Edenville, the Kibo, and the Mchuchuma Mines is planned for 2018. Botswana's production is expected to increase because of the opening of the Sese Mine in 2017, the Mea and Mmamabula West Mines in 2018, and the Takatokwane Mine in 2020. The Morupule Mine could reach full capacity by 2018. Coal mining is likely to increase in Congo (Kinshasa) because of the expansion of the Luena Mine by 2019 and also in Ethiopia and Malawi (table 20).

Trade Review and Outlook

Sub-Saharan Africa's current account deficit amounted to 2.4% of the GDP in 2013. Oil-exporting countries had an average current account surplus of 3.7% of the GDP. Middle-income oil-importing countries had an average current account deficit of 5.4% of the GDP, and low-income oil-importing countries, an average deficit of 11.7% of the GDP (International Monetary Fund, 2014, p. 65).

The average current account deficit for middle-income oil-importing countries is expected to be 5.2% of the GDP in 2014 and 5% of the GDP in 2015. For low-income oil-importing countries, the deficit is forecasted to be 12.4% of the GDP in 2014 and 12.3% of the GDP in 2015. For oil-exporting countries, the surplus is predicted to be 3.3% of the GDP in 2014 and 1.8% of the GDP in 2015. Sub-Saharan Africa is expected to run a current account deficit of 2.6% of the GDP in 2014 and 3.2% of the GDP in 2015 (International Monetary Fund, 2014, p. 65).

In 2013, Europe received 44% of Africa's petroleum exports; China, 19%; the United States, 12%; India, 9%; and other countries in the Asia and the Pacific region, 8%. West African countries sent 44% of their exports to China, India, and other countries in the Asia and the Pacific region and 33% to Europe. North African countries sent 68% of their exports to Europe and 8% to the United States (BP p.l.c., 2014, p. 18).

Africa's natural gas exporters included Algeria, which accounted for 51.6% of the continent's natural gas exports; Nigeria, at least 27%; Libya, 6.3%; Equatorial Guinea, 6.1%; Egypt, at least 4.5%; and Mozambique, 3.5%. Spain received 21% of total African natural gas exports; Italy, 20%; Japan, 12%; France, 8%; and Turkey and the Republic of Korea, 6% each. Intraregional exports to other African countries accounted for only 8% of total African natural gas exports (BP p.l.c., 2014, p. 28).

In 2013, Asian countries (particularly China) received the vast majority of Africa's iron ore exports. Intraregional trade to other African countries accounted for less than 2% of total African iron ore exports (World Steel Association Committee on Economic Studies, 2014a, p. 103; 2014b, p. 21).

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TABLE 1
AFRICA: AREA AND POPULATION IN 2013

Country	Area[1] (square kilometers)	Estimated population[2] (thousands)
Algeria	2,381,741	39,208
Angola	1,246,700	21,472
Benin	112,622	10,323
Botswana	581,730	2,021
Burkina Faso	274,200	16,935
Burundi	27,830	10,163
Cameroon	475,440	22,254
Cape Verde	4,033	499
Central African Republic	622,984	4,616
Chad	1,284,000	12,825
Comoros	2,235	735
Congo (Brazzaville)	342,000	4,448
Congo (Kinshasa)	2,344,858	67,514
Côte d'Ivoire	322,463	20,316
Djibouti	23,200	873
Egypt	1,001,450	82,056
Equatorial Guinea	28,051	757
Eritrea	117,600	6,333
Ethiopia	1,104,300	94,101
Gabon	267,667	1,672
Gambia, The	11,295	1,849
Ghana	238,533	25,905
Guinea	245,857	11,745
Guinea-Bissau	36,125	1,704
Kenya	580,367	44,354
Lesotho	30,355	2,074
Liberia	111,369	4,294
Libya	1,759,540	6,202
Madagascar	587,041	22,925
Malawi	118,484	16,363
Mali	1,240,192	15,302
Mauritania	1,030,700	3,890
Mauritius	2,040	1,296
Mayotte	374 [3]	208 [3]
Morocco	446,550	33,008
Mozambique	799,380	25,834
Namibia	824,292	2,303
Niger	1,267,000	17,831
Nigeria	923,768	173,615
Reunion	2,512 [3]	793 [3]
Rwanda	26,338	11,777
Sao Tome e Principe	964	187 [4]
Senegal	196,722	14,133
Seychelles	455	89
Sierra Leone	71,740	6,092
Somalia	637,657	10,496
South Africa	1,219,090	52,982
South Sudan	644,329	11,090 [4]
Sudan	1,861,484	34,848 [4]
Swaziland	17,364	1,250
Tanzania	947,300	49,253

See footnotes at end of table.

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TABLE 1—Continued
AFRICA: AREA AND POPULATION IN 2013

Country	Area[1] (square kilometers)	Estimated population[2] (thousands)
Tunisia	163,610	10,887
Uganda	241,038	37,579
Western Sahara	266,000	538 [4]
Zambia	752,618	14,539
Zimbabwe	390,757	14,150
Total	30,315,129	1,107,323
World total	510,072,000	7,125,000

[1]Source: U.S. Central Intelligence Agency, The World Factbook 2013.
[2]Source: The World Bank, 2014 World Development Indicators Database.
[3]Source: Embassy of France in Washington, DC.
[4]Source: U.S. Census Bureau.

TABLE 2
AFRICA: GROSS DOMESTIC PRODUCT[1,2]

Country	Gross domestic product in 2013 based on purchasing power parity		Real gross domestic product growth rate (percentage)		
	Gross value (billion dollars)	Per capita (dollars)	2011	2012	2013
Algeria	522.6	13,788	2.8	3.3	2.8
Angola	166.1	7,978	3.9	5.2	6.8
Benin	18.5	1,793	3.3	5.4	5.6
Botswana	31.7	15,241	6.2	4.3	5.9
Burkina Faso	27.7	1,638	5.0	9.0	6.6
Burundi	7.9	877	4.2	4.0	4.5
Cameroon	62.9	2,861	4.1	4.6	5.5
Cape Verde	3.2	6,248	4.0	1.2	0.5
Central African Republic	2.8	604	3.3	4.1	-36.0
Chad	26.8	2,432	0.1	8.9	3.9
Comoros	1.1	1,617	2.5	3.0	3.5
Congo (Brazzaville)	26.1	6,232	3.4	3.8	3.2
Congo (Kinshasa)	50.5	655	6.9	7.2	8.5
Côte d'Ivoire	65.2	2,710	-4.4	10.7	8.7
Djibouti	2.7	2,916	4.5	4.8	5.0
Egypt	910.0	10,870	1.8	2.2	2.1
Equatorial Guinea	25.6	33,767	5.0	3.2	-4.8
Eritrea	7.6	1,197	8.7	7.0	1.3
Ethiopia	126.7	1,427	11.4	8.8	9.7
Gabon	32.1	20,520	6.9	5.5	5.6
Gambia, The	3.1	1,642	-4.3	5.3	6.3
Ghana	103.0	4,029	15.0	8.8	7.1
Guinea	14.7	1,321	3.9	3.8	2.3
Guinea-Bissau	2.4	1,411	9.0	-2.2	0.3
Kenya	126.0	3,009	7.6	4.6	4.6
Lesotho	5.3	2,765	4.3	6.0	5.7
Liberia	3.7	887	7.5	8.3	8.7
Libya	126.6	20,681	-62.1	104.5	-13.6
Madagascar	32.1	1,398	1.5	2.5	2.4
Malawi	12.8	748	4.3	1.9	5.2
Mali	25.2	1,493	2.7	0.0	1.7
Mauritania	11.8	3,187	4.0	7.0	6.7
Mauritius	22.3	17,118	3.9	3.2	3.2
Mayotte	NA	NA	NA	NA	NA
Morocco	241.7	7,356	5.0	2.7	4.4
Mozambique	27.0	1,046	7.3	7.3	7.1

See footnotes at end of table.

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TABLE 2—Continued

AFRICA: GROSS DOMESTIC PRODUCT[1, 2]

Country	Gross domestic product in 2013 based on purchasing power parity		Real gross domestic product growth rate (percentage)		
	Gross value (billion dollars)	Per capita (dollars)	2011	2012	2013
Namibia	22.2	10,234	5.7	5.0	4.3
Niger	16.3	984	2.3	11.1	4.1
Nigeria	972.6	5,746	4.9	4.3	5.4
Reunion	NA	NA	NA	NA	NA
Rwanda	17.4	1,608	7.5	8.8	4.7
Sao Tome e Principe	0.6	2,999	4.9	4.0	4.0
Senegal	31.7	2,243	1.7	3.4	3.5
Seychelles	2.2	23,532	7.9	2.8	3.5
Sierra Leone	11.7	1,924	6.0	15.2	20.1
Somalia[3]	1.3	128	2.6	2.6	NA
South Africa	662.6	12,507	3.6	2.5	1.9
South Sudan	26.1	2,401	NA	-47.6	27.1
Sudan	152.3	4,429	-1.2	-2.8	3.3
Swaziland	8.4	7,646	-0.6	1.9	2.8
Tanzania	84.9	1,834	6.4	6.9	7.0
Togo	9.5	1,390	4.8	5.9	5.1
Tunisia	119.7	10,998	-1.9	3.7	2.3
Uganda	61.9	1,681	6.2	2.8	5.8
Western Sahara[4]	0.9	2,500	NA	NA	NA
Zambia	57.1	3,926	6.4	6.8	6.7
Zimbabwe	25.6	1,954	11.9	10.6	3.3
Regional total	5,161	4,660[5]	4.7[6]	4.3[6]	5.2[6]
World total	101,934	14,307[5]	4.1	3.4	3.3

NA Not available.

[1]Source: International Monetary Fund, World Economic Outlook Database, October 2014.

[2]Gross domestic product listed may differ from that reported in individual country chapters owing to differences in the source or date of reporting.

[3]Source: United Nations Data 2012.

[4]Source: U.S. Central Intelligence Agency, The World Factbook 2007 estimate.

[5]Calculated using country data reported by the International Monetary fund and the World Bank.

[6]Weighted average.

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TABLE 3
SELECTED SIGNIFICANT AFRICAN EXPLORATION SITES IN 2013

Country	Type[1]	Site	Commodity[2]	Company	Resource[2,3]
Burkina Faso	F	Bombore	Au	Orezone Gold Corp.	4.6 Moz Au (D).
Do.	F	Houndé	Au	Endeavor Mining Corp.	1.5 Moz Au (R).
Do.	F	Karma	Au	True Gold Mining Inc.	949,000 oz Au (PR).
Do.	P	Mana	Au	SEMAFO, Inc.	2.3 Moz Au (R).
Do.	F	Yaramoko	Au	Roxgold Inc.	850,000 oz Au (ID).
Congo (Kinshasa)	F	Kapulo	Cu	Mawson West Ltd.	188,000 t Cu (D)
Eritrea	P	Bisha	Au, Ag, Cu, Zn	Nevsun Resources Ltd.	750,000 oz Au, 36 Moz Ag, 472,000 t Cu, 1.2 Mt Zn (R).
Ghana	E	Kubi	Au	PMI Gold Corp.	233,000 oz Au (D).
Do.	P	Wassa	Au	Golden Star Resources Ltd.	1.5 Moz Au (R).
Guinea	F	Tri-K	Au	Avocet Mining plc.	480,000 oz Au (PR).
Liberia	F	Dugbe F	Au	Hummingbird Resources plc.	1.9 Moz Au (D).
Mali	E	Fekola	Au	Papillon Resources Ltd.	4.6 Moz Au (D).
Namibia	D	Otjikoto	Au	B2Gold Corp.	1.3 Moz Au (PR).
Sierra Leone	E	Nimini	Au	Polo Resources Ltd.	550,000 oz Au (D).
South Africa	E	Platreef	PGM, Au, Cu, Ni	Ivanhoe Platinum Ltd.	38 Moz 3PGM, 3.4 Moz Au, 1.1 Mt Cu, 1.7 Mt Ni (D).
Do.	E	Waterberg	Pt, Pd, Au, Cu, Ni	Platinum Group Metals Ltd.	5.2 Moz Pt, 10.6 Moz Pd, 1.7 Moz Au, 62,000 t Cu, 73,000 t Ni (IF).
Sudan	E	Block 14 (Galat Sufar)	Au	Orca Gold Inc.	1.3 Moz Au (D).
Zambia	E	Mumbwa	Cu, Au, Ag, U_3O_8	Blackthorn Resources Ltd.	795,000 t Cu, 33,000 oz Au, 1.1 Moz Ag, 937 t U_3O_8 (D).

Do. Ditto.

[1]D—Approved for development; E—Active exploration; F—Feasibility work ongoing/completed; P—Exploration related to existing producing operation.

[2]Abbreviations used in this table for commodities include the following: Ag—silver; Au—gold; Cu—copper; Ni—nickel; Pd—palladium; PGM—platinum-group metals; Pt—platinum; U_3O_8—uranium oxide; Zn—zinc. Abbreviations used in this table for units of measure include the following: Moz—million troy ounces; Mt—million metric tons; oz—troy ounces; t—metric tons.

[3]Based on 2013 data reported from various sources; D—measured + indicated; ID—indicated; IF—inferred; PR—probable; R—proven + probable. Resource data not verified by the U.S. Geological Survey.

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TABLE 4

AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2013[1]

(Thousand metric tons unless otherwise specified)

	Metals									
	Aluminum		Chromite, mine output, gross weight	Cobalt, mine output, Co content (metric tons)	Copper, mine output, Cu content	Gold, mine output (kilograms)	Iron and steel		Lead, mine output, Pb content (metric tons)	Manganese ore, mine output, Mn content
Country	Bauxite	Metal[2]					Iron ore, gross weight	Steel, crude		
Algeria	--	--	--	--	--	140	1,067	440	--	--
Angola	--	--	--	--	--	--	--	--	--	--
Benin	--	--	--	--	--	--	--	--	--	--
Botswana	--	--	--	248	51	1,206	--	--	--	--
Burkina Faso	--	--	--	--	--	32,714 [3]	--	--	--	23 [e]
Burundi	--	--	--	--	--	400 [e]	--	--	--	--
Cameroon	--	75	--	--	--	1,600 [e, 4]	--	--	--	--
Cape Verde	--	--	--	--	--	--	--	--	--	--
Central African Republic	--	--	--	--	--	60 [e, 4]	--	--	--	--
Chad	--	--	--	--	--	--	--	--	--	--
Congo (Brazzaville)	--	--	--	--	--	150 [e]	--	--	--	--
Congo (Kinshasa)[e]	--	--	--	58,000	970	17,000	--	NA	--	--
Côte d'Ivoire	--	--	--	--	--	12,862	--	--	--	99
Djibouti	--	--	--	--	--	--	--	--	--	--
Egypt	--	520	--	--	--	11,101	3,000 [e]	6,754	--	40 [e]
Equatorial Guinea	--	--	--	--	--	NA	--	--	--	--
Eritrea	--	--	--	--	22	2,900	--	--	--	--
Ethiopia	--	--	--	--	--	12,581	--	130 [e]	--	--
Gabon	--	--	--	--	--	1,136	--	--	--	1,800 [e]
Gambia, The	--	--	--	--	--	--	--	--	--	--
Ghana	827	40 [e]	--	--	--	88,376 [5]	--	--	--	533 [e]
Guinea	16,900	--	--	--	--	15,428 [6]	--	--	--	--
Kenya[e]	--	11	--	--	--	2,100	--	400	--	--
Lesotho	--	--	--	--	--	--	--	--	--	--
Liberia	--	--	--	--	--	600 [e, 4]	4,698	--	--	--
Libya	--	--	--	--	--	--	--	715	--	--
Madagascar[e]	--	--	91	2,200	--	--	--	--	--	--
Malawi	--	--	--	--	--	--	--	--	--	--
Mali	--	--	--	--	--	40,803 [7]	--	--	--	--
Mauritania	--	--	--	--	38	9,517	13,000	5 [e]	--	--
Mauritius	--	--	--	--	--	--	--	--	--	--
Morocco and Western Sahara	--	--	--	1,353	18	550	301	558	17,435	49
Mozambique	7	562	--	--	--	198	--	--	--	--
Namibia	--	--	--	--	5	1,960	--	--	11,000 [e]	76 [e]
Niger	--	--	--	--	--	1,150	--	--	--	--

See footnotes at end of table.

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TABLE 4—Continued
AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2013[1]

(Thousand metric tons unless otherwise specified)

	Metals									
	Aluminum						Iron and steel			
Country	Bauxite	Metal[2]	Chromite, mine output, gross weight	Cobalt, mine output, Co content (metric tons)	Copper, mine output, Cu content	Gold, mine output (kilograms)	Iron ore, gross weight	Steel, crude	Lead, mine output, Pb content (metric tons)	Manganese ore, mine output, Mn content
Nigeria[e]	--	2 [8]	--	--	--	4,200	50	400	--	--
Reunion	--	--	--	--	--	--	--	--	--	--
Rwanda	--	--	--	--	--	--	--	--	--	--
Senegal	--	--	--	--	--	6,445	--	--	--	--
Seychelles	--	--	--	--	--	--	--	--	--	--
Sierra Leone	616	--	--	--	--	98	20,300	--	--	--
Somalia	--	--	--	--	--	--	--	--	--	--
South Africa	--	822	13,645	2,800 [e]	77	159,724	71,543	7,200 [e]	41,848	4,300
South Sudan	--	--	--	--	--	--	--	--	--	--
Sudan	--	--	31	--	--	24,813	--	--	--	1,593
Swaziland	--	--	--	--	--	--	1,200 [e]	--	--	--
Tanzania	50 [e]	--	--	--	6	43,390	--	--	--	--
Togo[e]	--	--	--	--	--	19,000	50	--	--	--
Tunisia	--	--	--	--	--	--	244	109	--	--
Uganda[e]	--	--	--	--	--	--	5	64	--	--
Zambia[e]	--	--	--	5,200	760	4,500	--	55	--	40
Zimbabwe	--	--	355	319	8	14,065	--	15 [e]	--	--
Total	18,400	2,030	14,100	70,100	1,960	531,000	115,000	16,800	70,300	8,550
Share of world total	7%	4%	41%	63%	11%	19%	4%	1%	1%	46%
United States	NA	1,950	--	--	1,250	230,000	53,000	86,900	340,000	--
Share of world total	NA	3%	--	--	7%	8%	2%	5%	6%	--
World total	282,000	56,400	34,500	112,000	18,100	2,860,000	3,210,000	1,730,000	5,420,000	18,700

See footnotes at end of table.

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TABLE 4—Continued
AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2013[1]

(Thousand metric tons unless otherwise specified)

Country	Metals—Continued	Industrial minerals				Mineral fuels		
	Zinc, mine output, Zn content (metric tons)	Cement, hydraulic	Diamond, natural (thousand carats)[9]	Graphite (metric tons)	Phosphate rock, gross weight	Coal, anthracite and bituminous	Petroleum, crude (thousand 42-gallon barrels)	Uranium, U_3O_8 content (metric tons)
Algeria	--	18,000	--	--	1,151	--	574,875	--
Angola	--	1,700 e	9,360 [10]	--	--	--	657,365	--
Benin	--	1,422	--	--	--	--	--	--
Botswana	--	--	23,190 [11]	--	--	1,496	--	--
Burkina Faso	64	580	--	--	--	--	--	--
Burundi	--	100 e	--	--	--	--	--	--
Cameroon	--	1,400 e	3	--	--	--	24,275	--
Cape Verde	--	--	--	--	--	--	--	--
Central African Republic	--	--	(12) e	--	--	--	--	--
Chad e	--	200	--	--	--	--	35,000	--
Congo (Brazzaville)	--	170 e	56	--	--	--	88,338	--
Congo (Kinshasa)	12,566	447	18,045 [13]	--	--	4	8,351	--
Côte d'Ivoire	--	80 e	--	--	--	--	9,141	--
Djibouti	--	150 e	--	--	--	--	--	--
Egypt	--	50,000 e	--	--	5,922	--	260,610	--
Equatorial Guinea	--	--	--	--	--	--	100,000 e	--
Eritrea	--	260 e	--	--	--	--	--	--
Ethiopia	--	5,000 e	--	--	--	--	--	--
Gabon	--	200 e	NA	--	--	--	85,447	--
Gambia, The	--	--	--	--	--	--	--	--
Ghana e	--	3,000	169 [8]	--	--	--	35,500	--
Guinea	--	377	202	--	--	--	--	--
Kenya	--	5,059	--	--	--	--	--	--
Lesotho	--	--	414 [14]	--	--	--	--	--
Liberia	--	182	44	--	--	--	--	--
Libya	--	2,000 e	--	--	--	--	360,620	--
Madagascar e	--	150	--	4,300	--	--	36 [8]	--
Malawi e	--	320	--	--	--	98	--	1,335 [8]
Mali	--	--	--	--	20 e	--	--	--
Mauritania	--	650 e	--	--	--	--	2,500	--
Mauritius	--	--	--	--	--	--	--	--
Morocco and Western Sahara e	47,600	14,900	--	--	26,400	--	1,847	--
Mozambique	--	1,299	--	--	--	6,343	--	--
Namibia	184,109	662	1,689	--	--	--	--	5,098

See footnotes at end of table.

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TABLE 4—Continued

AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2013[1]

(Thousand metric tons unless otherwise specified)

Country	Metals—Continued	Industrial minerals				Mineral fuels		
	Zinc, mine output, Zn content (metric tons)	Cement, hydraulic	Diamond, natural (thousand carats)[9]	Graphite (metric tons)	Phosphate rock, gross weight	Coal, anthracite and bituminous	Petroleum, crude (thousand 42-gallon barrels)	Uranium, U_3O_8 content (metric tons)
Niger	--	70 e	--	--	--	242	6,498	5,300
Nigeria e	--	18,000	--	--	--	40 e	800,488 [8]	--
Reunion	--	--	--	--	--	--	--	--
Rwanda	--	100 e	--	--	--	--	--	--
Senegal	--	5,191	--	--	882	--	117	--
Seychelles	--	NA	--	--	--	--	--	--
Sierra Leone	--	313	609 [15]	--	--	--	--	--
Somalia	--	--	--	--	--	--	--	--
South Africa	30,145	13,500 e	8,168	--	2,132	256,282	139	626
South Sudan	--	--	--	--	--	--	44,000 e	--
Sudan	--	3,500 e	--	--	--	--	45,200	--
Swaziland	--	--	--	--	--	205 e	--	--
Tanzania	--	2,600 e	180 [16]	--	20 e	129	--	--
Togo	--	1,233	(12)	--	1,214	--	--	--
Tunisia	--	7,504	--	--	3,283	--	22,035	--
Uganda	--	2,023	--	--	--	--	--	--
Zambia e	--	1,200	--	--	--	200	--	--
Zimbabwe e	--	1,200	10,412 [8]	6,934 [8]	6	4,980	--	--
Total	274,000	165,000	72,500	11,200	41,000	270,000	3,160,000	12,400
Share of world total	3%	4%	55%	1%	17%	4%	11%	17%
United States	784,000	77,400	--	--	31,200	1,000,000	2,720,000	2,160
Share of world total	6%	2%	--	--	13%	15%	10%	3%
World total	13,400,000	4,090,000	131,000	1,100,000	243,000	6,860,000	28,500,000	73,900

See footnotes at end of table.

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TABLE 4—Continued

AFRICA: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2013[1]

[e]Estimated; estimated data, U.S. data, and world totals are rounded to no more than three significant digits. NA Not available. -- Zero or zero percent.

[1]Totals may not add owing to independent rounding. Percentages are calculated on unrounded data. Includes data available as of September 8, 2015.

[2]Primary and secondary production.

[3]Excludes artisanal mining production, which is estimated to fluctuate between 1,000 and 10,000 kilgrams per year.

[4]From artisanal mining.

[5]Excludes artisanal and small-scale mining output.

[6]Excludes artisanal mining, which has historically ranged between 1,500 and 5,000 kilograms per year.

[7]Excludes artisanal mining, which is estimated to be more than 3,000 kilgrams per year.

[8]Reported figure.

[9]Gemstones and industrial diamond.

[10]Approximately 90% gem and 10% industrial grade.

[11]Assumed to contain about 70% gem and near gem.

[12]Less than ½ unit or ½ percent.

[13]An estimated 20% of total diamond is gem quality; the majority of production is from artisanal mining.

[14]Estimated to be approximately 60% gem quality.

[15]Approximately 80% gem and 20% industrial grade.

[16]Estimated to represent 85% gem-quality or semigem-quality and 15% industrial-quality stones. Excludes smuggled artisanal production.

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TABLE 5

AFRICA: HISTORIC AND PROJECTED BAUXITE MINE PRODUCTION, 2005–2020[1]

(Thousand metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Ghana	727	595	753	827	800	800	800
Guinea	14,600	15,900	16,041	16,887	27,000	47,000	57,000
Mozambique	10	9	8	7	7	7	7
Sierra Leone	--	1,090	776	616	1,000	1,000	1,000
Tanzania	2	39	58	50	50	50	50
Total	15,300	17,600	17,600	18,400	29,000	49,000	59,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

TABLE 6

AFRICA: HISTORIC AND PROJECTED PRIMARY AND SECONDARY ALUMINUM METAL PRODUCTION, 2005–2020[1]

(Thousand metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Cameroon	87	76	52	75	70	70	70
Egypt[2]	244	461	517	520	520	520	520
Ghana	--	--	40	40	40	40	40
Kenya[2]	2	8	9	11	11	11	11
Mozambique	555	557	564	562	570	570	570
Nigeria	--	21	26	2	--	--	--
South Africa	846	807	665	822	700	700	700
Total	1,730	1,930	1,870	2,030	1,900	1,900	1,900

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

[2]Egypt produced primary and secondary refined aluminum; primary production in all other African aluminum-producing countries, with the exception of Kenya, which also produced secondary refined aluminum.

TABLE 7

AFRICA: HISTORIC AND PROJECTED COBALT MINE PRODUCTION, 2005–2020[1]

(Metal content in metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Botswana	326	272	195	248	200	200	200
Burundi	--	--	--	--	100	520	1,000
Congo (Kinshasa)	24,500	60,000	52,000	58,000	61,000	64,000	74,000
Madagascar	--	--	670	2,200	5,900	5,900	5,900
Morocco	1,100	3,130	1,314	1,353	2,500	2,500	2,500
South Africa	400	1,800	2,500	2,800	2,800	3,000	3,100
Zambia	9,300	6,200	4,200	5,200	5,200	6,000	6,000
Zimbabwe	281	79	88	319	300	300	300
Total	35,900	71,500	61,000	70,100	78,000	82,000	93,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

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TABLE 8

AFRICA: HISTORIC AND PROJECTED COPPER MINE PRODUCTION, 2005–2020[1]

(Metal content in thousand metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Botswana	31	48	36	51	31	81	81
Burundi	--	--	--	--	--	2	4
Congo (Kinshasa)	97	420	660	970	880	1,000	1,300
Eritrea	--	--	--	22	50	21	50
Mauritania	--	37	38	38	40	40	40
Morocco	4	13	18	18	20	20	20
Namibia	10	--	5	5	7	7	7
South Africa	89	103	81	77	61	110	120
Tanzania	4	6	6	6	6	6	3
Uganda	--	--	--	--	18	18	18
Zambia	447	672	695	760	800	1,000	1,300
Zimbabwe	3	5	6	8	10	10	10
Total	685	1,300	1,550	1,960	1,900	2,300	3,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

TABLE 9

AFRICA: HISTORIC AND PROJECTED REFINED COPPER METAL PRODUCTION, 2005–2020[1]

(Thousand metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Congo (Kinshasa)	--	261	473	685	740	850	1,100
Egypt[2]	3	3	3	3	4	4	4
Namibia	--	--	--	--	17	20	25
South Africa	99	81	66	81	53	90	90
Zambia	399	527	530	568	600	600	600
Zimbabwe	7	5	3	3	5	5	5
Total	508	877	1,080	1,340	1,400	1,600	1,800

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

[2]Produced only secondary refined copper; primary refined copper produced in all other African countries.

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TABLE 10

AFRICA: HISTORIC AND PROJECTED GOLD MINE PRODUCTION, 2005–2020[1]

(Metal content in kilograms)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Algeria	--	723	264	140	200	200	200
Benin[2]	--	--	--	--	--	--	--
Botswana	4	1,774	1,522	1,206	1,400	1,400	1,400
Burkina Faso[3]	625	22,939	28,939	32,714	35,700	40,000	40,100
Burundi	--	300	400	400	540	700	900
Cameroon[2]	1,000	1,600	1,500	1,600	(4)	(4)	(4)
Central African Republic[2]	15	59	55	60	100	5,000	5,000
Chad	150	100	(4)	(4)	(4)	(4)	(4)
Congo (Brazzaville)	120	150	150	150	(4)	(4)	(4)
Congo (Kinshasa)	7,200	12,000	14,000	17,000	38,000	38,000	38,000
Cote d'Ivoire[3]	1,335	5,310	11,027	12,862	17,500	24,100	29,400
Egypt	--	9,847	8,148	11,101	15,000	15,000	15,000
Equatorial Guinea	200	200	(4)	(4)	(4)	(4)	(4)
Eritrea	25	50	9,735	2,900	3,200	4,700	5,500
Ethiopia	4,376	6,773	12,311	12,581	12,000	15,000	17,000
Gabon[2]	300	--	666	1,136	1,200	1,400	1,400
Ghana[3]	66,852	76,332	86,699	88,376	86,700	101,000	98,400
Guinea[3]	25,097	15,217	14,790	15,428	16,900	21,100	21,100
Kenya	616	2,355	3,600	2,100	200	200	200
Liberia[2]	27	666	641	600	4,800	7,600	7,600
Madagascar	10	46	157	--	--	--	--
Mali[3]	44,230	36,360	40,132	40,803	41,800	43,400	40,800
Mauritania	--	8,305	7,652	9,517	10,000	10,000	10,000
Morocco	1,786	650	519	550	700	700	700
Mozambique	63	106	178	198	850	1,500	1,700
Namibia[5]	2,703	2,675	2,302	1,960	6,800	8,300	8,300
Niger	4,962	1,950	1,662	1,150	750	1,500	1,500
Nigeria	30	3,718	4,000	4,200	4,000	4,000	4,000
Rwanda	10	3	--	--	--	--	--
Senegal	600	4,381	6,666	6,445	7,100	7,500	10,800
Sierra Leone[6]	53	270	135	98	100	3,100	3,100
South Africa	294,671	188,702	155,286	159,724	160,000	170,000	170,000
Sudan	3,625	26,317	46,133	24,813	37,000	43,000	55,000
Tanzania	47,270	39,448	40,650	43,390	56,000	54,000	51,000
Togo[7]	6,179	10,452	18,551	19,000	20,000	20,000	20,000
Uganda	46	4	1	--	--	--	--
Zambia	440	3,600	4,500	4,500	5,500	6,000	6,000
Zimbabwe	14,024	9,100	14,742	14,065	15,000	16,000	16,000
Total	529,000	492,000	538,000	531,000	600,000	660,000	680,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

[2]From artisanal mining.

[3]Excludes production from artisanal mining.

[4]Gold is produced, but information is inadequate to make reliable estimates of output.

[5]Does not include gold produced as a byproduct of copper mining.

[6]From artisanal mining for the years 2005 and 2010 only.

[7]May include artisanal gold production from neighboring countries; however, information is inadequate to make reliable estimates of the output that originated from these countries.

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TABLE 11

AFRICA: HISTORIC AND PROJECTED BENEFICIATED IRON ORE PRODUCTION, 2005–2020[1]

(Fe content in thousand metric tons)

Country	Average grade	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Algeria	50%	800	771	946	565	800	1,600	1,600
Burundi	61%	--	--	--	--	40	210	420
Egypt	55%	880	700	1,500	1,500	1,500	1,500	1,500
Gabon	64%	--	--	--	--	--	1,100	2,000
Guinea	37% to 55%	--	--	--	--	3,000	44,000	63,000
Kenya	60%	--	17	40	--	--	--	--
Liberia	34% to 61%	--	--	1,980	2,800	6,900	18,600	22,300
Mauritania	59% to 72%	7,000	7,500	7,280	8,450	11,700	16,300	16,300
Morocco	54%	4	24	141	146	270	270	270
Mozambique	50%	--	--	--	--	300	1,000	1,000
Nigeria	36% to 56%	20	23	25	18	--	500	1,900
Sierra Leone	58% to 65%	--	--	3,600	11,900	7,300	10,400	14,400
South Africa	62% to 65%	24,900	36,900	42,000	42,500	52,000	54,000	55,000
Swaziland	44.5%	--	--	460	530	--	--	--
Tanzania	52%	--	--	--	--	--	520	1,500
Togo	30%	--	--	16	15	15	15	15
Tunisia	54%	108	94	117	127	100	100	100
Uganda	61% to 67%	--	2	3	3	12	220	330
Zambia	65%	--	--	--	--	10	100	200
Zimbabwe[2]	51%	185	--	--	--	--	--	100
Total		33,900	46,000	58,100	68,600	84,000	150,000	180,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

[2]Average iron content for Zimbabwe prior to 1996 was 61%; since 1996, the average grade has been 51%.

TABLE 12

AFRICA: HISTORIC AND PROJECTED CRUDE STEEL PRODUCTION, 2005–2020[1]

(Thousand metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Algeria	1,007	662	557	440	3,000	3,000	4,000
Congo (Kinshasa)	110	NA	NA	NA	NA	NA	NA
Egypt	5,565	6,700	6,627	6,754	12,000	12,000	12,000
Ethiopia	60	150	130	130	730	1,700	1,700
Kenya	--	290	340	400	400	400	400
Libya	1,255	825	315	715	1,000	2,000	2,000
Mauritania	1	5	5	5	10	10	10
Morocco	205	485	539	558	600	600	600
Nigeria	100	100	400	400	400	400	400
South Africa	9,494	7,617	6,938	7,200	7,600	10,000	12,000
Tanzania	--	--	--	--	200	600	1,300
Tunisia	66	115	109	109	200	200	200
Uganda	30	59	60	64	70	260	360
Zambia	--	40	50	55	100	100	200
Zimbabwe	107	14	15	15	15	15	15
Total	18,000	17,100	16,100	16,800	26,000	31,000	35,000

[e]Estimated. NA Not available. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

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TABLE 13

AFRICA: HISTORIC AND PROJECTED NICKEL MINE PRODUCTION, 2005–2020[1]

(Metal content in metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Botswana	39,335	24,931	17,948	22,842	21,000	21,000	21,000
Burundi	--	--	--	--	5,700	5,700	11,000
Madagascar	--	--	8,300	27,000	63,000	63,000	63,000
Morocco	99	317	288	175	300	300	300
South Africa	42,392	39,960	45,945	51,208	58,000	68,000	87,000
Zambia	--	2,482	--	--	--	5,000	40,000
Zimbabwe	8,556	6,200	7,899	14,058	15,000	15,000	15,000
Total	90,400	73,900	80,400	115,000	160,000	180,000	240,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

TABLE 14

AFRICA: HISTORIC AND PROJECTED PALLADIUM MINE PRODUCTION, 2005–2020[1]

(Metal content in kilograms)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Botswana	NA	3,328	2,613	1,337	1,100	1,100	1,100
Burundi	--	--	--	--	110	550	1,100
South Africa	82,961	82,222	74,738	76,008	85,000	97,000	120,000
Zimbabwe	3,879	7,000	7,800	10,153	10,000	13,000	13,000
Total	86,800	92,600	85,200	87,500	96,000	110,000	140,000

[e]Estimated. NA Not available. -- Negligible or no prodution.

[1]Estimated data and totals are rounded to no more than three significant digits.

TABLE 15

AFRICA: HISTORIC AND PROJECTED PLATINUM MINE PRODUCTION, 2005–2020[1]

(Metal content in kilograms)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Botswana	NA	560	435	218	190	190	190
Burundi	--	--	--	--	60	300	600
Ethiopia	--	8	--	--	--	--	--
South Africa	163,711	147,790	128,590	137,024	150,000	170,000	190,000
Zimbabwe	4,834	8,800	10,500	13,066	13,000	16,000	16,000
Total	169,000	157,000	140,000	150,000	160,000	190,000	210,000

[e]Estimated.. NA Not available. -- Negligible or no production

[1]Estimated data and totals are rounded to no more than three significant digits.

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TABLE 16

AFRICA: HISTORIC AND PROJECTED TIN MINE PRODUCTION, 2005–2020[1]

(Metal content in metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Burundi	4	12	50	1	3	3	3
Congo (Kinshasa)	4,400	8,000	4,800	3,700	6,600	15,000	16,000
Egypt	--	--	100	111	2,200	2,200	2,200
Morocco	--	--	--	--	5,300	5,300	5,300
Niger	14	6	--	--	--	--	--
Nigeria	1,300	520	570	570	600	600	600
Rwanda	170	3,300	2,900	3,100	6,000	7,000	7,000
Uganda	--	32	--	20	20	20	20
Total	5,890	11,900	8,420	7,500	21,000	30,000	31,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

TABLE 17

AFRICA: HISTORIC AND PROJECTED TIN METAL PRODUCTION, 2005–2020[1]

(Metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Congo (Kinshasa)	--	--	--	--	1,800	1,800	11,000
Nigeria	25	--	--	--	--	--	--
Rwanda	200	--	--	--	2,200	2,200	2,200
Total	230	--	--	--	4,000	4,000	13,000

[e]Estimated. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

TABLE 18

AFRICA: HISTORIC AND PROJECTED DIAMOND PRODUCTION, 2005–2020[1]

(Thousand carats)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Angola	7,079	8,362	8,331	9,360	9,200	9,700	10,000
Botswana	31,890	22,019	20,550	23,190	27,000	27,000	27,000
Cameroon	12	6	5	3	5	5	5
Central African Republic	383	302	366	--	250	350	350
Congo (Brazzaville)	--	381	52	56	70	70	70
Congo (Kinshasa)	35,207	16,964	22,093	18,045	17,000	21,000	21,000
Côte d'Ivoire	300	--	--	--	10	100	150
Gabon	(2)	NA	NA	NA	--	--	--
Ghana	1,013	334	233	169	200	300	450
Guinea	549	374	267	202	200	250	250
Lesotho	52	104	479	414	400	600	600
Liberia	NA	27	42	44	40	40	40
Namibia	1,902	1,693	1,629	1,689	1,900	1,900	1,900
Sierra Leone	669	438	541	609	620	650	650
South Africa	15,776	8,868	7,250	8,168	9,400	10,000	10,000
Tanzania	220	80	127	180	270	310	310
Togo	41	(2)	(2)	(2)	(2)	(2)	(2)
Zimbabwe	251	8,435	12,060	10,412	8,000	8,000	6,000
Total	95,300	68,400	74,000	72,500	75,000	80,000	79,000

[e]Estimated. NA Not available. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

[2]Less than 1 unit.

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TABLE 19
AFRICA: HISTORIC AND PROJECTED LITHIUM PRODUCTION, 2005–2020

(Metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Zimbabwe	1,100	47,000	53,000	50,000	50,000	50,000	50,000

[e]Estimated data are rounded to no more than three significant digits.

TABLE 20
AFRICA: HISTORIC AND PROJECTED SALABLE COAL PRODUCTION, 2005–2020[1]

(Thousand metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Botswana	985	988	1,455	1,496	2,300	6,000	12,000
Congo (Kinshasa)	120	--	4	4	4	1,300	2,000
Egypt	300	NA	NA	NA	NA	NA	NA
Ethiopia	--	20	20	20	40	150	200
Malawi	52	65	92	98	180	180	180
Mozambique	3	38	4,954	6,343	21,000	37,000	47,000
Niger	182	247	235	242	250	250	250
Nigeria	8	46	40	40	50	50	50
South Africa	244,940	254,522	259,012	256,282	280,000	300,000	330,000
Swaziland	222	146	152	205	200	200	200
Tanzania	31	(2)	79	129	370	2,200	5,500
Zambia	240	200	200	200	300	300	300
Zimbabwe	2,891	2,668	3,500	4,980	5,000	6,000	6,000
Total	250,000	259,000	270,000	270,000	310,000	350,000	400,000

[e]Estimated. NA Not available. -- Negligible or no production.

[1]Estimated data and totals are rounded to no more than three significant digits.

[2]Less than 1 unit.

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The Mineral Industry of Algeria

By Mowafa Taib

Algeria was an important supplier of crude oil, helium, and natural gas to the world in 2013. The country was the world's third-ranked producer of helium after the United States and Canada and the fourth-ranked exporter of natural gas in terms of volume (Hamak, 2014; Organization of the Petroleum Exporting Countries, 2014, p. 28, 30). In 2013, Algeria was the leading natural gas producer and exporter in Africa and the world's seventh-ranked exporter of liquefied natural gas (LNG), accounting for about 5% of the world's total LNG exports. The country was Africa's third-ranked crude oil producer after Angola and Nigeria. Algeria accounted for 2.7% and 2.3% of the world's crude oil and natural gas output, respectively. The country held 4.5 trillion cubic meters of proven natural gas reserves, which was 2.4% of the world's total proven reserves, and 12.2 billion barrels (Gbbl) of proven crude oil reserves, which was 0.7% of the world's total reserves. The volume of Algeria's proven reserves of natural gas was ranked second in Africa after Nigeria, and its crude oil proven reserves were ranked fourth in Africa after Angola, Libya, and Nigeria. Additionally, Algeria held the world's third largest amount of shale gas (estimated by U.S. Energy Information Administration to be 20 trillion cubic meters), and 5.7 Gbbl of shale oil (BP p.l.c., 2014, p. 6, 8, 20, 22; U.S. Energy Information Administration, 2014). Algeria is a member of the Organization of the Petroleum Exporting Countries and the Gas Exporting Countries Forum (Gas Exporting Countries Forum, 2014; Organization of the Petroleum Exporting Countries, 2014, p. 8).

Output of nonfuel minerals included iron and steel, small quantities of gold and silver, and a wide variety of industrial minerals that included barite, bentonite and other clays, cement, crushed stone, diatomite, dolomite, feldspar, gypsum, lime, limestone, marble, nitrogen, phosphate rock, pozzolan, quartzite, salt, sand and gravel, and sulfur. The country was responsible for 2% of world's pumice (pozzolan) output and 1% of the world's gypsum output. Algeria held other minable mineral resources that were not being produced in 2013, including diamond and other gemstones, fluorite, niobium, perlite, rubidium, shale gas, tantalum, tin, and uranium (table 1; Crangle, 2014a, b; Ministère de l'Energie et des Mines, 2014).

In January 2013, a militant group operating in North Africa and the Sahel stormed the In Aminas natural gas treatment facility, which is located in eastern Algeria near the border with Libya, causing several casualities and halting production in the facility. The In Aminas facility produced about 10% of the country's natural gas output and 16% of its gas exports. The facility was operated by a joint venture of BP p.l.c. of the United Kingdom, Sonatrach S.p.A. of Algeria, and Statoil A.S.A. of Norway. In the aftermath of the attack, BP and Statoil pulled out their employees from the In Aminas facility as well as the In Salah natural gas treatment plant, which is located in central Algeria. The Government and international oil companies began to review their security arrangements for crude oil and natural gas facilities in the country and enhanced the safety measures in place for hydrocarbon activity throughout Algeria (U.S. Energy Information Administration, 2014).

Minerals in the National Economy

Algeria's gross domestic product (GDP) increased in real terms by 2.7% in 2013 compared with an increase of 3.3% in 2012. The value of the hydrocarbon sector activity, which accounted for 32.4% of the GDP in 2013 compared with 36.8% in 2012, decreased by 0.6% compared with that of 2012. The decrease in value was the result of decreased volumes of crude oil, condensate, and natural gas exports and a slightly lower crude oil price, which, for Algeria, was $109.38 per barrel in 2013 compared with $111.49 per barrel in 2012 (International Monetary Fund, 2014b, p. 13; Organization of the Petroleum Exporting Countries, 2014, p. 82).

Government Policies and Programs

The Government continued its golden share policy, which was initiated in 2010, concerning foreign investment in the country. The policy gives the Government majority ownership (that is, at least a 51% share) in the local operations of new companies operating in Algeria as well as a seat on the company's board of directors but not voting rights. Consequently, the maximum foreign ownership share of any new company operating in Algeria in any sector of the economy, including in the mineral industry, is 49%.

To increase hydrocarbon production, which had been declining in recent years, the Government attempted to attract participation of international oil companies by introducing amendments to the hydrocarbon law. Under the revised law, taxes are assessed on profits rather than on revenue; this change is intended to make exploration of smaller fields more viable. The Government had been promoting economic diversity by planning major mineral industry projects, such as aluminum and steel mills and ammonia and other fertilizer plants. An important challenge for the Government was to be able to produce sufficient quantities of natural gas for such projects while maintaining current levels of natural gas exports and meeting the increased domestic demand for natural gas for electric power generation and other types of consumption (Nield, 2010, 2013).

The hydrocarbon sector is regulated by ordinance No. 06–10 of July 29, 2006, which is a supplement to law No. 05–07 of April 28, 2005. The ordinance grants Sonatrach 51% ownership of all hydrocarbon projects in the country. Environmental laws applicable to the mineral industry include law No. 03–10 of July 19, 2003, and associated decrees and law No. 05–12 of September 4, 2005.

The Government amendments to the hydrocarbon law are also intended to give international oil companies the incentive to

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develop the country's vast nonconventional gas resources, such as shale gas reserves, which were estimated by the Government to be 27 trillion cubic meters, which is six times greater than the country's conventional gas reserves of 4.5 trillion cubic meters (Baxter, 2014). The Government was expected to initiate a new oil and gas licensing round in 2014. Government-owned Sonatrach planned to begin initial shale gas production in 2022 and had set a production target of 28.3 million cubic meters per day by 2025 based on favorable market conditions and the acquisition of production technology (Baxter, 2014).

Ordinance No. 07–02 of March 1, 2007, amends and supplements the mining law. The Mining Law guarantees parity for all investors, allows separate surface and underground mine tenure; ensures that disputes can be appealed to international arbitrators, gives incentives for importing equipment for mining operations, and provides custom-tariff exemptions and rebates on mineral extraction royalties. In 2013, the Government was working on an amendment to the mining law to attract international companies to invest in the country's unexploited and underexploited mineral resources.

Production

Notable increases in mineral commodity production in 2013 compared with that of 2012 included those of feldspar (by 59%), marble blocks (20%), pozzalan (19%), common clay (16%), calcite and helium (15% each), limestone (10%), and refinery products (5%). Notable decreases in mineral commodity production in 2013 compared with that of 2012 included those of dolomite (by 92%), kaolin (58%), gold (47%), iron ore (40%), silver (36%), methanol (30%), ammonia (29%), lime (27%), crude steel (21%), crushed marble (17%), barite (16%), phosphate rock (8%), and dry natural gas (4%) (table 1).

Structure of the Mineral Industry

The Ministère de l'Energie et des Mines [Ministry of Energy and Mining] (MEM) is responsible for regulating the activities of the mineral industry through its numerous agencies. The Agence Nationale du Patrimoine Minier [Algerian Mining Authority] (ANPM) and the Agence National de la Geologie et du Controle Minier [National Agency of Geology and Mining Control] (ANGCM) were created by mining law No. 01–10 of July 3, 2001. ANPM is responsible for awarding mining licenses (Agence Nationale du Patrimoine Minier, 2013; Ministère de l'Energie et des Mines, 2013, p. 44–45).

The Office National de la Recherché Géologique et Minière [National Office of Geologic and Mining Research] (ORGM), which was created by Decree No. 92–31 of January 20, 1992, has been a partner with almost all the mining companies involved in exploration, exploitation, and prospecting activities in the country. ORGM employed 2,200 people and provided geochemical, geologic, and geophysical surveys as well as chemical assays and drilling services. In 2012 (the latest year for which data were available), employment in the state-owned mining companies increased by 2% to 29,409 people from 28,953 people in 2011. The number of employees in private mining companies increased slightly to 20,427 from 20,406 in 2011 (Ministère de l'Energie et des Mines, 2013, p. 45, 54; World Investment News, 2013).

The Algerian hydrocarbon sector operations were conducted by Sonatrach and several international oil companies working in Algeria under production-sharing agreements. In 2013, Sonatrach was responsible for 53% and 84% of crude oil and natural gas production, respectively, and the remainder was produced by international oil companies, including Anadarko Petroleum Corp. of the United States; BP Algerie, which was a subsidiary of BP; Compañía Española de Petróleos, S.A.U. (Cepsa) of Spain; Eni Algeria Production BV of Italy; Repsol YPF S.A. of Spain; Statoil; and Total Algeria S.p.A. of France (Sonatrach S.p.A., 2014, p. 16–17; U.S. Energy Information Administration, 2014).

Sonatrach was the leading oil company in Africa and the 12th-ranked oil company in the world in terms of the amount of its hydrocarbon production. The state-owned company, which employed 50,608 people in 2013, carried out diverse operations in mining and the extraction of crude oil and natural gas; it was responsible for the exploration, production, pipeline transportation, and marketing of hydrocarbons and their byproducts. Sonatrach had 155 affiliates and subsidiaries, 105 of which were located in Algeria and 50 of which were located in such countries as Argentina, Libya, Mauritania, Mali, Peru, Spain, and Tunisia (table 2; Sonatrach S.p.A., 2014, p. 72).

The Government-owned Enterprise Nationale de Fer et du Phosphate (Ferphos Group S.p.A.) managed Algeria's production of iron ore, phosphate rock, pozzolan, and other building materials. Its subsidiaries included Société des Mines de Phosphates S.p.A. (SOMIPHOS), which was the state's phosphate rock mining company; Société des Mines de Fer d'Algérie S.p.A. (SOMIFER), which was the iron ore mining company; and Société des Pouzzolanes et des Matériaux de Construction S.p.A. (SPMC), which produced pozzolan and other building materials (Agence Nationale du Patrimoine Minier, 2013).

The state-owned industrial group Manal S.p.A. [also known as Société de Manadjem El Djazair (Algerian Mines Co.)] was created by Presidential Decree No. 11–85 of February 16, 2011. Manal replaced Société de Gestion des Participations de Mines de l'Etat (SOMINES), which had been in charge of the assets of five state-owned mining companies, including Enterprise Nationale d'Exploitation des Carrières de Sels Industriels et Domestiques et Commercialisation des Sels S.p.A. (ENASEL), Entreprise Nationale du Marbre S.p.A., Entreprise Nationale des Produits Miniers Non Ferreux et des Substances Utiles S.p.A (ENOF), and Ferphos. Manal assumed responsibility for the development, exploration, exploitation, distribution, and marketing of the country's nonfuel mineral resources. Manal also oversaw financial, industrial, and partnership aspects of mining operations in Algeria (African Manager, 2014).

Mineral Trade

Algeria's exports decreased in value by 11% in 2013 to $65.6 billion from $71.9 billion in 2012. The value of hydrocarbon exports included $30.4 billion for crude oil, $25.7 billion for natural gas [including liquefied natural gas (LNG)], and $8.8 billion

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for refinery products. Other nonfuel mineral exports included ammonia (valued at $304 million), phosphate rock ($97 million), helium and hydrogen ($39 million each), and zinc ($15 million). Natural gas exports, which accounted for 41% of Algeria's primary energy exports, decreased in volume by 14% to 32.7 billion cubic meters in 2013 from 37.3 million cubic meters in 2012; crude oil exports, which accounted for 42.2% of the primary energy exports, decreased by 11% to 222.2 million barrels (Mbbl) from 250.4 Mbbl in 2012. Exports of petroleum products, however, increased by 29% to 165.4 Mbbl in 2013 from 128 Mbbl in 2012. Other hydrocarbon exports included 48.4 Mbbl of condensate, 58.1 Mbbl of liquefied petroleum gas (LPG), and 24.4 million cubic meters of LNG (Banque d'Algérie, 2014, p. 27; Organization of the Petroleum Exporting Countries, 2014, p. 49, 54, 56; Sonatrach S.p.A., 2014, p. 9).

Algeria's crude oil exports went to Europe (72%), the Americas (18%), and the Asia and the Pacific region (10%). Natural gas exports were received mainly by Spain (34%), Italy (27%), France (12%), and Turkey (9%). Exports of petroleum products were transported to the United States (43%), European countries (21%), Brazil (14%), China (7%), Japan (6%), and other countries (9%) (U.S. Energy Information Administration, 2014).

U.S. exports to Algeria increased in value by about 36% to about $1.85 billion in 2013 from about $1.36 billion in 2012. The value of U.S. imports from Algeria has been decreasing since 2008 when they had peaked at about $19.4 billion. In 2013, the value of U.S. imports from Algeria decreased by about 52% to $4.8 billion from about $10.0 billion in 2012. The value of U.S. crude oil imports from Algeria decreased to $1.2 billion in 2013 from $4.7 billion in 2012 and a peak of $11.5 billion in 2007; fuel oil imports decreased to $3.3 billion from $4.0 billion in 2012; and imports of LPG decreased to $160 million from $1.2 billion in 2012, and a peak of $4.7 billion in 2008. The decrease in U.S. hydrocarbon imports from Algeria followed the general trend of decreased global petroleum exports to the United States as a result of an increase in U.S. domestic production (United Nations Statistics Division, 2014; U.S. Census Bureau, 2014).

Algeria's total imports increased in value to $54.9 billion in 2013 from $50.4 billion in 2012. The top import categories were motor vehicles and refined petroleum products, which were valued at about $3.8 billion each. Imports of semifinished and finished steel products decreased in value to about $1.9 billion from $2.1 billion in 2012 but increased in volume to 5.1 million metric tons (Mt) in 2013 from 5.0 Mt in 2012 and about 4 Mt in 2011. In 2013, Algeria was the world's seventh-ranked net importer of steel products. The country's cement imports were estimated to be 5 Mt (Banque d'Algérie, 2014, p. 172; United Nations Statistics Division, 2014; World Cement, 2014; World Steel Association, 2014, p. 25).

Commodity Review

Metals

Gold.—Entreprise d'Exploitation des Mines d'Or S.p.A. (ENOR) was the sole gold producer in the country, producing from the Amesmessa Mine in southern Algeria. Gold production from the mine decreased to 140 kilograms (kg) in 2013 from 264 kg in 2012 and the peak production of about 1,000 kg in 2009. The decrease was attributed to the lower grade of gold being extracted from the Amesmessa-Tirek Mine in recent years (table 1; Entreprise d'Exploitation des Mines d'Or S.p.A., 2014).

Cancor Mines Inc. of Canada, which had four exploration permits in Algeria for copper, gold, and silver located 2,000 kilometers (km) south of Algiers in the Hoggar region, did not report any new activity in 2013. Exploration activities were suspended in the region because of recent political and military activity in neighboring Mali. Cancor permits in Algeria included two gold-silver permits for the Ouzzul North and the Tirek North properties and two copper-gold permits for the Tan Chaffao East and the Tan Chaffao West properties. In early 2014, Cancor was expected to sign a binding merger agreement with Yorbeau Resources Inc. of Canada and become a wholly owned subsidiary of Yorbeau (Cancor Mines Inc., 2014).

Iron Ore and Iron and Steel.—Algeria's iron ore production decreased by 40% to about 1.1 Mt in 2013 after an increase of 38% to 1.78 Mt in 2012. Crude steel production decreased by 21% to 440,000 metric tons (t) from 557,000 t in 2012. The fluctuations in iron ore and crude steel production were attributed to disputes between the operating company, the Government, and workers unions. Algeria, which was the seventh-ranked net importer of steel in the world in 2013, imported 5.1 Mt of steel products, including 4.0 Mt of long products, 700,000 t of flat products, and about 300,000 t of tubular products to meet the demand for steel products in the domestic market. The country's apparent consumption of crude steel equivalent increased by about 48% to 5.9 Mt in 2012 from about 4.0 Mt in 2011 (table 1; World Steel Association, 2013, p. 78; 2014, p. 25).

ArcelorMittal Tebessa S.p.A., which was a joint venture of ArcelorMittal of Luxembourg (70% interest) and Ferphos (30% interest), operated the Boukhadra and the Ouenza iron ore mines in Tebessa Province. ArcelorMittal Annaba S.p.A., which was a joint venture of ArcelorMittal (73% interest) and state-owned Enterprise Nationale de Sidérurgie (Group Sider) (30% interest), operated the El Hadjar steel plant in Annaba. In September, ArcelorMittal signed an agreement with Group Sider to invest $763 million for the development of the steel complex in Annaba and the iron mines in Boukhadra and Ouenza. Under the agreement, ArcelorMittal reduced its stake in both ArcelorMittal Annaba and ArcelorMittal Tebessa to 49% from 70%, and Ferphos and Sider purchased ArcelorMittal's share (21%) in their ventures, thus becoming majority owners and ArcelorMittal the minority owner in both ventures (table 2; ArcelorMittal, 2013).

In March, Qatar International Co., which was a joint venture of Qatar Mining Co. and Qatar Steel Co., signed an agreement with the Government to build a 4-million-metric-ton-per-year (Mt/yr) steel mill in the Bellara Industrial Zone, which is located in Jijel Province about 360 km east of Algiers. The mill would be built in two stages, and a 2-Mt/yr-capacity direct-reduced-iron-based steel works would be added at each stage. Ownership in the new project would follow Algeria's new partnership rules, which gives the Government a 51% share and Qatar International a 49% share. The Government's share would be

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divided equally between Group Sider and Fonds National de l'Investissement (Qatar Steel Co. Q.S.C., 2013).

In June, Tosyali Industrie du Fer et de l'acier Algérie, which was owned by Tosyali Holding of Turkey, commenced production at its new iron and steel plant in Oran. The $750 million plant had been built in 19 months and had the capacity to produce 1.25 Mt/yr of liquid steel; the plant employed more than 1,000 people in 2013 and was expected to employ 1,400 workers by yearend 2014 (Tosyali Holding, 2013).

Lead and Zinc.—Western Mediterranean Zinc S.p.A. (WMZ) was a joint venture of Terramin Australia Ltd. (65% interest), state-owned ENOF (32.5% interest), and ORGM (2.5% interest). The joint venture was formed to develop the Tala Hamza lead and zinc project on the 125-square-kilometer Oued Amizour exploration permit, which is located 15 km southwest of the Port of Bejaia in northeastern Algeria. In 2013, Terramin entered into a technical cooperation agreement with China NonFerrous Metals Industry's (NCF) Foreign Engineering and Construction Co. Ltd. NFC undertook a technical and financial assessment of mining methods for Tala Hamza and presented its findings to ENOF and the ORGM. The report led to Terramin and its partners agreeing to a revised definitive feasibility study to determine a preferred mining method that would be economically and technically viable, based on preliminary modeling (Terramin Australia Ltd., 2014).

As of yearend 2013, the total resource (measured, indicated, and inferred) at the Tala Hamza deposit was 68.6 Mt grading 1.2% lead and 4.6% zinc at a 2.5%-zinc cutoff grade (Terramin Australia Ltd., 2014). The results of an earlier definitive feasibility study completed by Terramin in 2010 indicated that a project could be developed on the Tala Hamza deposit using block cave and conventional processing. The proposed project would have a production capacity of 2 Mt/yr of ore, which would be processed to produce 100,000 metric tons per year (t/yr) of zinc in concentrate and 25,000 t/yr of lead in concentrate in the first phase. In the second phase, production would increase to 4 Mt/yr of ore to produce 200,000 t/yr of zinc in concentrate grading 53% zinc at a 90% recovery rate and 40,000 t/yr of lead in concentrate grading 60% lead at a 72% recovery rate (Terramin Australia Ltd., 2010, 2014).

Industrial Minerals

Barite, Bentonite, and Kaolin.—ENOF operated 18 mines and quarries and produced nonferrous metal mineral commodities through six subsidiaries. These subsidiaries were La Société des Feldspaths d'Algérie (SOFELD), Société Algérienne des Granulats S.p.A. (ALGRAN), Société des Bentonites d'Algérie S.p.A. (BENTAL), Société des Diatomites d'Algérie (DIATAL), Société des Kaolins d'Algérie S.p.A. (SOALKA), and Société des Mines de Baryte d'Algérie S.p.A. (SOMIBAR) (table 2).

SOMIBAR produced barite from the Amin Mimoun Mine in Khenchela Province, the Boucaid Mine in Tissemsilt Province, and the Mellal Mine in Tlemcen Province. BENTAL produced bentonite from the Maghnia Mine in Tlemcen Province and the M'Zila deposit in Mostagnem Province (Entreprise d'Exploitation des Mines d'Or S.p.A., 2014).

SOALKA was a joint venture of Federal White Cement Ltd. of Canada (63% interest) and ENOF (37% interest). SOALKA explored for and produced kaolin for the ceramic industry (Société des Kaolins d'Algérie S.p.A., 2014).

Algeria produced 37,000 t/yr of barite on average during the period between 2009 and 2013, which was not sufficient to meet the demand of Sonatrach's operations in and outside Algeria. In December, a new joint venture of Sonatrach (60% interest) and Manal (40% interest) was created to develop the Draissa barite deposit, which is located in Bechar Wilaya in western Algeria. Sonatrach' stake in the company was divided equally among three of its subsidiaries—L'Entreprise Nationale de Forage (Algerian National Drilling Co.), Entreprise Nationale des Travaux aux Puits (National Well Engineering Co.), and Entreprise des Services aux Puits (National Company of Well Services), whereas Manal's stake was assumed by ENOF, which was one of Manal's subsidiaries. The new company, National Company for Barium (Barytal) was expected to have the capacity to produce 100,000 t/yr of barite by 2017 (Bariyo and O'Driscoll, 2013).

Cement.—Cement production in Algeria amounted to 18 Mt in 2013 compared with 19 Mt in 2012. Cement consumption, on the other hand, amounted to 23 Mt in 2013 compared with 21 Mt in 2012. Thus, the Government imported about 5 Mt of cement to meet the national demand. Demand for cement in Algeria had been on the rise in recent years because of increased construction activities in general and in the housing sector in particular. The Government planned to expand its residential-building capacity to 120,000 units per year from 80,000 units per year. New investments in the cement sector and expansion plans for existing plants were expected to increase cement output in Algeria to 29 Mt/yr by 2018 (World Cement, 2014).

Lafarge Group of France was a significant cement producer in Algeria. The company owned and operated two cement plants at M'Sila and Oggaz and two industrial aggregates facilities. The two plants had a combined production capacity of 9.4 Mt/yr of cement, which was the second largest capacity for the company in Africa and the Middle East after the company's operations in Egypt. The company claimed a 36% share of the Algerian cement market in 2013. Lafarge's output of cement increased by 9% in 2013 compared with that of 2012 (Lafarge S.A., 2014, p. 34, F71).

Zahana Cement Co. produced 785,000 t of cement in 2013 compared with 809,000 t in 2012 at its plant in Zahana, which was located 40 km south of Oran in western Algeria. The plant was owned by the Government (65% interest) and managed by ASEC Cement of Egypt (35% interest). ASEC Cement also had a 49% stake and management rights in ASEC Algeria Cement Co. S.p.A. (AACC), which was building a 3.4-Mt/yr-capacity greenfield cement plant at Djefla, which is located about 300 km south of Algiers. The project included two production lines; the first line would have the capacity to produce 1.5 Mt/yr of cement and would cost $300 million to build. The second line would increase the capacity to 3.4 Mt/yr and would cost $250 million to build. The limestone for the cement plant would come from the Djellal El Gharbi deposit, which is located about 1 km from the plant and had resources sufficient to supply the plant for 80 years at projected production levels. Construction

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of the plant, which began in 2009, had been on hold for the past 4 years because of lack of funding and extensive governmental procedures. Following the decision of the public sector holding company to withdraw from funding the project in January, AACC began negotiations with Banque Extérieure d'Algérie to secure funding for the project (ASEC Cement, 2014, p. 3, 28).

Nitrogen.—Fertial S.p.A, which was a joint venture of Grupo Villar Mir of Spain (66% interest) and Asmidal Group (34% interest), was the sole producer of ammonia in Algeria for most of 2013. The company, which had the capacity to produce 1 Mt/yr of ammonia, 330,000 t/yr of compound fertilizers, and 580,000 t/yr of nitrogen fertilizers, exported about 75% of its output mainly to France, Morocco, Portugal, and Spain (Fertial, S.p.A., 2014).

Two major ammonia and urea production projects—Algeria Oman Fertilizer Co. and Sofert Algerie Spa—were at the final stage of construction by yearend 2013. Algeria Oman Fertilizer Co. (Sharika El Djazairia El Omania lil Asmida S.p.A.), which was a joint venture of Suhail Bahwan Group (Holding) L.L.C. of Oman (51% interest) and Sonatrach (49% interest), was expected to complete the construction of a nitrogen fertilizer plant in the Arzew Industrial Zone near Oran in northwestern Algeria. The commissioning of the project, which would have the capacity to produce 2.6 Mt/yr of urea and would cost $2.4 billion to build, was delayed until the second quarter of 2014 following the amendment of the agreement between Sonatrach and Suhail Bahwan Group on natural gas allocations (Suhail Bahwan Group LLC, 2014).

In May, Orascom Construction Industries S.A.E. (OCI) of Egypt and Sonatrach reached an agreement on the commercial and economic terms that govern operations at their Sofert Algeria joint-venture facility. The agreement enabled commencement of production at Sofert Algeria's fertilizer plant in Azrew later in the year. Sofert Algeria, which was a joint venture of OCI (51% interest) and Sonatrach (49% interest), built a fertilizer complex at the Azrew Industrial Zone that included two plants—an 800,000-t/yr-capacity anhydrous ammonia plant and a 1.2-Mt/yr-capacity granulated urea plant. Sofert was expected to supply 1.1 Mt/yr of urea to the domestic market and 700,000 t/yr of ammonia for export (Orascom Construction Industries S.A.E., 2014).

Mineral Fuels and Related Materials

Helium.—The output of helium was estimated to have increased by 15% in 2013 compared with that of 2012 because of the resumption of helium production at the Helison plant at Skikda in northern Algeria in late 2013. Two new LNG trains were commissioned by Sonatrach in 2013; they were the GLIK at Skikda, which had the capacity to produce 163 million cubic meters per year of enriched helium gas, and the GL3Z at Arzew, which had the capacity to produce 350,000 cubic meters per year of enriched helium gas (Sonatrach S.p.A., 2013).

Natural Gas and Petroleum.—Algeria's production of crude oil and condensate increased by 2.5% in 2013 compared with a decrease of 6.4% in 2012. Gross natural gas output amounted to 179 billion cubic meters of natural gas, which included 81.5 billion cubic meters of dry (marketed) gas. In 2013, Sonatrach commissioned a 4.5-Mt/yr LNG megatrain at Skikda. The project replaced the original plant, which had been severely damaged in 2004 as a result of an industrial accident. KBR Inc. of the United States conducted the front-end engineering and design as well as the engineering and procurement contract for the $3.5 billion project (KBR Inc., 2014).

Algeria's installed refining capacity of crude oil and condensate increased to 652,500 barrels per day (bbl/d) from 592,000 bbl/d in 2012. The increase in capacity was the result of expansions at the existing five refineries. The Government was building four new 100,000-bbl/d-capacity refineries at Biskra, Ghardaia, Hassi Messaoud, and Tairet. Construction of the new refineries and expansion projects at the existing refineries were expected to be completed by 2018 (U.S. Energy Information Administration, 2014).

In 2013, Algeria had 2,061 producing wells, which included 191 wells that were completed during the year. The number of hydrocarbon discoveries in Algeria totaled 31 in 2013 compared with 20 discoveries in 2012. One crude oil discovery in the southern region of Hassi Messaoud and one natural gas discovery under the Hassi R'Mel field were reported in Algeria in 2013 compared with 3 oil discoveries and 23 natural gas discoveries in 2012 (Noueihed, 2013; Organization of the Petroleum Exporting Countries, 2014, p. 25–27).

Forty percent of Algeria's crude oil and condensate output, which averaged 1.58 million barrels per day (Mbbl/d) in 2013, came from the Hassi Messaoud field, which was operated by Sonatrach. First oil was produced at the El Merk field in March. The field was located in the Sahara desert, south of the Hassi Messaoud field. The El Merk field produced 160,000 bbl/d and was managed by Sonatrach and Anadarko. The El Merk central processing facility commenced production in October and was expected to produce 6.2 billion cubic meters per year of natural gas. The field was developed by ConocoPhillips Co. of the United States, Eni S.p.A. of Italy, Maersk Oil A.S. of Norway, Petrofac Ltd. of the United Kingdom, and Talisman Energy Inc. of Canada (Sonatrach S.p.A., 2014, p. 17).

Sonatrach planned to invest $102 billion during the next 5 years in crude oil and natural gas projects to reverse the decline in production. The investment would be directed toward increasing offshore oil and gas reserves by raising exploration concessions to 79 by 2014 from 57 in 2012 and increasing the country's oil-refining capacity by installing five new oil refineries, as well as the development of nonconventional natural gas resources (Oil & Gas 360, 2014).

Outlook

In their consultation with the Government in 2014, International Monetary Fund experts emphasized the need for reform in Algeria "to improve the business climate, remove constraints to foreign investment, promote international trade integration, and reduce labor market rigidities" (International Monetary Fund, 2014a). The Algerian economy is heavily dependent on its hydrocarbon sector, and the Government economic diversification plans had not succeeded so far, as hydrocarbon exports continued to account for 98% of the country's total exports. The Government is seeking international

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investment and technological knowledge to develop the country's vast nonfuel mineral resources, including by encouraging joint ventures with international mining companies to explore and exploit the country's mineral resources of metals, such as gold, iron ore, and zinc. Such investment, however, had been moving slowly, in part because of the golden share policy, which gives the Government a majority stake in all new projects (International Monetary Fund, 2014a).

In 2014, the Government created a national company for iron and steel to explore for and develop iron ore deposits at Gara Djebilet and Mecheri Abdelaziz, which are located in southwestern Algeria near the border with Mauritania and hold an estimated 2.2 billion metric tons (Gt) of iron ore. The iron ore deposits at Gara Djebilet are located in the Reguibat Shield, which extends to Mauritania, and host an estimated 1.5 Gt of iron ore grading 56% iron. The Mecheri Abdelaziz deposit is located east of Gara Djebilet and holds an estimated 700 Mt of iron ore grading 52% iron. The new national company is owned by Sonatrach (55% interest), Manal (25% interest), and Sider (20%).

In 2014, the Government signed an energy and investment contract with Fertiberia S.A., which was owned by Grupo Villar Mir of Spain, to reactivate the construction of the El Bahia fertilizer plant at Arzew that had been proposed in 2007. The $1.5 billion plant was expected to produce 1.1 Mt/yr of ammonia for export and would require 3 to 4 years to complete (ICIS News, 2014).

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TABLE I
ALGERIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
METALS						
Gold, mine output, Au content	kilograms	999	723	449	264 r	140
Iron and steel:						
Iron ore:						
Gross weight		1,307	1,469	1,320	1,784 r	1,067
Fe content		700	771	693	946 r	565
Metal:						
Pig iron		680	696	360	350	350
Steel:						
Crude		597	662 r	551	557	440
Continuous cast		560	657	545	550	550
Silver, mine output, Ag content	kilograms	200	147	91	42 r	27
Zinc:						
Metal, smelter output	metric tons	24,115	21,127	15,611	15,000 e	15,000 e
Alloys	do.	612	390	686	700 e	700 e
INDUSTRIAL MINERALS						
Barite, crude	metric tons	37,981	42,254 r	40,000	36,211 r	30,245
Calcite		221	339	339	232 r	267
Cement, hydraulic		18,732	19,100	19,000	19,000	18,000
Clays:						
Bentonite	metric tons	31,612	34,126	29,000	26,278 r	27,668
Common		10,973	10,973	11,000	10,167 r	11,829
Kaolin	metric tons	87,766	71,065	71,065	100,970 r	42,504
Diatomite	do.	1,896 r	2,104 r	2,132	2,398 r	2,224
Dolomite (industrial)e	do.	2,260	2,260	2,260	743 r	60 3
Feldspar		131	164	148	163 r	259
Gypsum		1,757	1,610	1,610	1,958 r	2,078
Lime, hydraulic		65	63	63	66 r	48
Nitrogen, N content of ammoniae		500	600	593	713	509
Phosphate rock:						
Gross weight		1,017	1,525	1,287	1,250 r	1,151
P_2O_5 contente		305	458	386	375 r	345
Pozzolan		328	237	141	325 r	388
Salt, brine and sea salt		109	107	238	178 r	173
Sand and gravel:						
Construction sand	thousand cubic meters	3,372	3,164	4,100	2,898 r	2,635
Granulates:						
Aggregates, crushed stone, and gravel	do.	13,685	13,095	41,000	56,040 r	54,898
Crushed sand	do.	13,360	12,286	12,000	12,000 e	12,000 e
Silica sand		134	95	95	95	100
Stone:						
Aragonite		254	254	260	260	260
Marble:						
Blocks	thousand cubic meters	11 r	9	9	15 r	18
Crushed		266	114	119	287 r	239
Limestonee		10,000	10,000	10,400	20,000 r,3	22,000 3
Slabs	thousand square meters	53 r	53 e	55 e	-- r	--
Quartzitee		136	136	140	140	140
Tuffe	thousand cubic meters	7,525 3	1,819 3	1,700	1,700	1,700
Sulfur, S content of sulfuric acide		18	16	14	110	110
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	196,900	192,209	190,127	182,599	179,489
Dry	do.	82,600 r	83,370	82,060	85,195 r	81,543
Helium, liquid	do.	20	20	55 r	61 r	70
Methanol		101	93	118	112	78
Natural gas plant liquids	thousand 42-gallon barrels	139,135 r	114,805 r	107,351 r	95,325 r	97,577

See footnotes at end of table.

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TABLE 1—Continued
ALGERIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum:						
Crude, including condensate	thousand 42-gallon barrels	647,875 r	616,485 r	599,330 r	561,005 r	574,875
Refinery products:						
Liquefied petroleum gas	do.	6,388	6,862	6,059	6,601 r	6,612
Gasoline, normal	do.	8,465	9,128	10,710	10,000	9,600
Gasoline, super	do.	8,537	8,308	9,131	8,944	8,618
Naphtha	do.	37,908	60,988	57,017	52,101	53,755
Kerosene and jet fuel	do.	7,348	11,050	8,893	9,600	13,584
Distillate fuel oil	do.	51,175	55,618	55,654	51,474 r	52,533
Lubricants	do.	953	1,058	821	2,100 r	2,100
Residual fuel oil	do.	47,155	48,884	49,778	31,646 r	35,684
Bitumen	do.	1,880	1,279	1,058	1,060	1,000
Total	do.	169,809	203,175	199,121	174,000 r	183,000

eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. rRevised. do. Ditto. -- Zero.
[1]Table includes data available through October 15, 2014.
[2]In addition to the commodities listed, secondary aluminum, secondary copper, and secondary lead may be produced in small quantities, and crude construction materials (for local consumption), caustic soda, fertilizer, fuller's earth perlite, rhyolite, and urea are produced, but available information is inadequate to make reliable estimates of output.
[3]Reported figure.

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TABLE 2
ALGERIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Barite	Société des Mines de Baryte d'Algérie S.p.A. (SOMIBAR) [Entreprise Nationale des Produits Miniers Non Ferreux et des Substances Utiles, S.p.A. (ENOF)]	Amin Mimoun Mine, Khenchela Province	35,000
Do.	do.	Boucaid Mine, Tissemsilt Province	20,000
Do.	do.	Mellal Mine, Tlemcen Province	NA
Do.	Société des Baryte SARL (SOBAR)	Chaabet Abou Fares, Tipaza Province	7,000
Bentonite	Société des Bentonites d'Algérie S.p.A. (BENTAL) [a subsidiary of Entreprise Nationale des Produits Miniers Non Ferreux et des Substances Utiles, S.p.A. (ENOF)]	Hammam Boughrara, Tlemcen Province	18,000
Do.	do.	M'Sila Province	17,000
Do.	do.	Maghnia Mine, Tlemcen Province	16,000
Cement:			
Portland	Lafarge Ciment de M'Sila (Lafarge S.A., 99.99%)	M'Sila Province	5,000,000
Do.	Lafarge Ciment d'Oggaz (Lafarge S.A., 99.99%)	Oggaz, Mascara Province	4,400,000
Do.	Entreprise des Ciments et Dérivés d'Ech—Cheliff	Chlef	2,000,000
Do.	Société des Ciments de la Mitidja (Entreprise des Ciments et Dérivés duCentre, 65%, and Lafarge S.A, 35%)	Meftah	800,000
Do.	Société des Ciments de Sour El Ghozlane (Entreprise des Ciments et Dérivés du Centre, 65%, and Buzzi Unicem S.p.A., 35%)	Sour El Ghozlane	1,000,000
Do.	Société des Ciments Zahana (Entreprise des Ciments et Dérivés de l'Ouest, 65%, and ASEC Cement., 35%)	Zahana, Djefla Province	1,200,000
Do.	Société des Ciments Beni Saf (Entreprise des Ciments et Dérivés de l'Ouest, 90%, and Pharoan Group, 10%)	Beni Saf	1,000,000
Do.	Société des Ciments Saïda (Entreprise des Ciments et Dérivés de l'Ouest)	Hassasna	500,000
Do.	Société des Ciments d'Aïn-Touta (Entreprise des Ciments et Dérivés de l'Est)	Ain Touta	1,000,000
Do.	Société des Ciments d'Aïn-Kébira (Entreprise des Ciments et Dérivés de l'Est)	Ain-Kebira	1,000,000
Do.	Société des Ciments de Hamma-Bouziane (Entreprise des Ciments et Dérivés de l'Est)	Hamma-Bouziane	1,000,000
Do.	Société des Ciments de Hadjar Soud (Entreprise des Ciments et Dérivés de l'Est)	Bekkouche	900,000
Do.	Tabessa Cement Company S.p.A.	Tebessa	525,000
Do.	Société des Ciments de l'Algérois (Entreprise des Ciments et Dérivés du Centre)	Rais-Hamidou	368,000
White cement	Ciment Blanc d'Algerie S.p.A. (Lafarge S.A., 100%)	Oggaz, Mascara Province	550,000
Coke	ArcelorMittal Annaba S.p.A. (ArcelorMittal, 70%, and Groupe Industriel Sider, 30%)	El Hadjar, Annaba Province	1,200,000
Copper, cathode	Société Algérienne du Zinc S.p.A. (Entreprise Nationale de Métallurgie de Transformation des Métaux Non Ferreux, S.p.A., 100%)	Ghazaouet	30,000
Diatomite	Société des Diatomites d'Algérie (DIATAL) [Entreprise Nationale des Produits Miniers Non Ferreux et des Substances Utiles, S.p.A. (ENOF)]	Tahalait quarry, Sig	2,000
Dolomite	Société Algérienne des Granulats S.p.A. (ALGRAN)	Djebel Taioualet	8,000
Feldspar	Tufeal SARL	Bouaita	83,000
Do.	La Société des Feldspaths d'Algérie (SOFELD) [Entreprise des Nationale des Produits Miniers Non Ferreux et des Substances Utiles, S.p.A. (ENOF), 57%, and Entreprise de la Céramique Ouest, 43%]	Ain Barbar	200,000
Gold kilograms	Entreprise d'Exploitation des Mines d'Or S.p.A. (ENOR) (Sonatrach S.p.A., 100%)	Amesmessa-Terik gold mine	500
Gypsum	32 private sector units and 13 public sector units	Batn, Bejaia, Biskra, Bouira, Chlef, Ghardaia, Mascara, Milla, M'Sila, Medbea, O.El Bouaghi, Oran, Setif, Tiara	2,000,000

See footnotes at end of table.

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TABLE 2—Continued
ALGERIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Helium	million cubic meters	Helios S.p.A. (Sonatrach Valorisation Hydrocarbonés, 51%, and Helaps S.A., 49%)	GL1Z and GL3Z complexes, Arzew	17
Do.	do.	Helison Production S.p.A. (Linde AG, 50%, and Sonatrach S.p.A., 50%)	GL1K and GNL2K complexes, Skikda	163
Iron and steel:				
Crude steel		ArcelorMittal Annaba S.p.A. (Groupe Industriel Sider, 51%, and ArcelorMittal, 49%)	Electric arc furnace at El Hadjar, Annaba	400,000
Do.		do.	Hot-strip mill at El Hadjar, Annaba Province	1,800,000
Do.		Tosyali Industrie du Fer et de l'acier Algerie (Tosyali Holding)	Steel mill at Oran	1,250,000
Processed		do.	Cold-rolling mill at El Hadjar, Annaba Province	1,050,000
Do.		do.	Bar and wire rod mills at El Hadjar, Annaba Province	850,000
Do.		do.	Seamless tube mill at El Hadjar, Annaba Province	700,000
Do.		Entreprise Nationale de Tubes et de Transformation de Produits Plats (Groupe Industriel Sider, 100%)	Welded tube plant at Ghardaia	128,000
Do.		Société Algérienne de Fabrication Tubes en Spirale (Groupe Industriel Sider, 100%)	Welded tube plant at El Hadjar, Annaba Province	70,000
Iron ore		ArcelorMittal Tebessa S.p.A. (Ferphos S.p.A., 51%, and ArcelorMittal, 49%)	Ouenza Mine, Tebessa Province	1,200,000
Do.		do.	Boukhadra Mine, Tebessa Province	525,000
Do.		Société des Mines de Fer d'Algérie S.p.A. (SOMIFER)	Khanguet Mine, Tebessa Province	50,000
Do.		do.	Anini Mine, Setif Province	170,000
Do.		do.	Rouina Mine, Ain Defla Province	140,000
Kaolin		Société des Kaolins d'Algérie S.p.A. (SOALKA) [Federal White Cement Ltd., 63%, and Entreprise Nationale des Produits Miniers Non Ferreux et des Substances Utiles S.p.A. (ENOF), 37%]	El Milia Mine, Jijel Province	50,000
Do.		do.	Jebel Debbagh Mine, Guelma Province	15,000
Do.		SARL Faïenceries Algériennes	Adjarda, Chekfa	95,000
Lime		SODEPAC (ERCO Group)	Hassasna	93,000
Do.		Société de Chaux de l'Ouest	Oran	65,000
Do.		Unité Chaux de Chettaba (Société des Produits Dérivés de l'Est, 100%)	Chettaba	11,000
Limestone		Mittal Steel Annaba SPA	Oued N'hal	250,000
Marble:				
Blocks	cubic meters	Entreprise Nationale du Marbre S.p.A.	Oran and Skikda Province	10,460
Do.	do.	SMS Bouhouita SARL	Skikda Province	160
Crushed		Commercialisation du Marbre et de Dérivés de Marbre S.p.A. and Entreprise Nationale du Marbre S.p.A.	Chlef, Oran, Skikda, Tizi Ouzou, and Tlemcen Provinces	17,000
Methanol		Société Nationale de Pétrochimie S.p.A. (Sonatrach S.p.A., 100%)	Methanol plant, Arzew	113,000
Natural gas:				
Crude	million cubic meters	Sonatrach S.p.A.	Numerous gasfields, including Adrar, Hamra, Hassi R'Mel, and Sbaa	45,000
Liquefied	do.	do.	GL2Z complex, Azrew	11,152
Do.	do.	do.	GL1Z complex, Azrew	8,976
Do.	do.	do.	GL3Z complex, Azrew	5,576
Do.	do.	do.	GL1K complex, Skikda	6,000
Do.	do.	do.	GL2K complex, Arzew	2,992
Nitrogen, fertilizer:				
Ammonia		Fertial S.p.A. (Grupo Villar Mir, 66%, and Asmidal Group, 34%)	Arzew	500,000
Do.		do.	Annaba	500,000
Do.		Sofert Algerie S.p.A. [Orascom Construction Industries S.A.E. (OCI), 100%]	Arzew	800,000
Do.		Sharika El Djazairia El Omania lil Asmida S.p.A. (Suhail Bahwan Group (Holding) L.L.C., 51%, and Sonatrach S.p.A., 49%)	do.	1,460,000
Ammonium nitrate		Fertial S.p.A. (Grupo Villar Mir, 66%, and Asmidal Group, 34%)	do.	580,000

See footnotes at end of table.

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TABLE 2—Continued
ALGERIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Nitrogen, fertilizer—Continued:				
Urea		Sofert Algerie S.p.A. [Orascom Construction Industries, S.A.E. (OCI), 100%]	Arzew	1,200,000
Do.		Fertial S.p.A. (Grupo Villar Mir, 66%, and Asmidal Group, 34%)	do.	400,000
Do.		Sharika El Djazairia El Omania lil Asmida S.p.A. [(Suhail Bahwan Group (Holding) L.L.C., 51%, and Sonatrach S.p.A., 49%)]	do.	2,555,000
Phosphatic		do.	do.	280,000
Do.		do.	Annaba	300,000
Petroleum:				
Crude	42-gallon barrels per day	Sonatrach S.p.A.	About 50 oilfields, including Acheb West, Amassak/Tin-Yaguene, Draa Tamra, Edjeleh, El Borma, El Gassi, El Merk, Gassi-Touil East, Guellala, Hassi Messaoud North and South, Ohanet North, Rhourde El Baguel, Tin-Fouye, and Zarzaitine	1,700,000
Refined	do.	Société Nationale de Raffinage de Pétrole S.p.A. (NAFTEC)	RA1K refinery, Skikda	352,700
Do.	do.	do.	RHM refinery, Hassi Messaoud	163,500
Do.	do.	do.	RA1G refinery, El Harrach	63,400
Do.	do.	do.	RA1Z refinery, Arzew	58,500
Do.	do.	Société Nationale de Raffinage de Pétrole S.p.A. (NAFTEC), 70%, and China National Petroleum Corp. (CNPC), 30%	Adrar	14,400
Phosphate:				
Phosphate rock		Société des Mines de Phosphates S.p.A. (SOMIPHOS) (a subsidiary of Ferphos Group S.p.A)	Djebel Onk (Djemidjema and Kef Essenoun), Tebessa Province	1,600,000
Pozzolan		Société des Pouzzolanes et des Matériaux de Construction S.p.A. (SPMC)	Rockbet El Hassi	452,000
Do.		Société des Ciments Béni Saf (ERCO Group)	Beni Saf	11,000
Do.		Entreprise Nationale de Fer et de Phosphate	do.	600,000
Salt, crude:				
Rock		Enterprise Nationale d'Exploitation des Carrières de Sels Industriels et Domestiques et Commercialisation des Sels (ENASEL) S.p.A.	El Outaya, Biskra Province	100,000
Solar		Several private companies	Bethioua, Oran; El Meghaier, El Oued, Guergour Lamri, Setif Ouled Zouai, Oum el Bouaghi, and Sidi Bouziane, Relizane	100,000
Stone		Société Algérienne des Granulats S.p.A. (ALGRAN) [Entreprise Nationale des Produits Miniers Non Ferreux et des Substances Utiles S.p.A. (ENOF)]	Aggregate quarries at Adrad, Oufarnou, Arzew, Ghedir, Gustar, Keddara, Oued Fodda, Teioueit, and Timezrit	3,000,000
Do.		Société des Diatomites d'Algérie S.p.A. (DIATAL) [Entreprise Nationale des Produits Miniers Non Ferreux et des Substances Utiles S.p.A. (ENOF)]	Oggaz limestone quarry, near Sig	12,500
Do.		Société des Bentonites d'Algérie S.p.A. (BENTAL) [Entreprise Nationale des Produits Miniers Non Ferreux et des Substances Utiles S.p.A. (ENOF)]	Limestone quarries near Beni Saf and M'Said	12,000
Sulfuric acid		Société Algérienne du Zinc (Enterprise Nationale de Métallurgie et de Transformation des Métaux Non Ferreux, 100%)	Ghazaouet	70,000
Tuff	cubic meters	CTIC-CRCC Group (China)	Annaba, Boumerdes, Sidi Bel Abbes Mustganem, Mascara, Oran, Relizane	10,300,000
Do.	do.	Six public sector units and 59 private units	Ain Temouhent, Tipaza, Tiaret	2,000,000

Do., do. Ditto. NA Not available.

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The Mineral Industry of Angola

By Omayra Bermúdez-Lugo

The mineral sector, in particular the petroleum industry, played an important role in Angola's economy. Angola accounted for about 2.1% of world petroleum output in 2013 and was the second-ranked petroleum producer in Africa after Nigeria. Petroleum accounted for about 97% of the country's total exports in 2013, 80% of Government revenue, and 42% of the gross domestic product (GDP). Angola was also a significant diamond producer. In 2013, the country produced about 7% of world rough diamond output, which contributed $1.3 billion to Government revenue. Other mineral commodities produced included cement, fuller's earth, granite, gypsum, limestone, marble, quartz, salt, sand, silica sand, and crushed stone (table 1). Gold was also produced, but information was inadequate to make reliable estimates of output. Angola's real GDP grew by an estimated 6.8% in 2013; nominal GDP was estimated to be $124 billion (BP p.l.c., 2014, p. 8; International Monetary Fund, 2014; Kimberley Process Rough Diamond Statistics, 2014; World Bank, The, 2014, p. 6, 8, 11).

Angola was the United States 71st-ranked goods export market in 2013, and its 38th-ranked supplier of goods imports. In 2013, the country's exports to the United States were valued at $8.7 billion. About 93% of these exports was crude petroleum valued at $8.1 billion. Fuel oil accounted for about $586 million, and petroleum products, for $1.4 million. Imports from the United States were valued at about $1.4 billion; these included nearly $316 million in drilling and oilfield equipment, about $34 million in excavating machinery, nearly $27 million in iron and steel products, $16.8 million in petroleum products, $1.6 million in iron and steel mill products, and $1.1 million in nuclear fuel materials. Angola also exported a total of 12.5 million carats of diamond to the world valued at $2.2 billion (U.S. Census Bureau, 2014a, b; Kimberley Process Rough Diamond Statistics, 2014; Office of the United States Trade Representative, 2014).

Table 1 provides data on the principal mineral commodities produced in Angola from 2009 to 2013, and table 2 provides a list of major mineral industry facilities in 2013. More-extensive coverage of the mineral sector of Angola can be found in the 2011 and 2012 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available at http://minerals.usgs.gov/minerals/pubs/country/africa.html#ao.

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TABLE 1
ANGOLA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009[e]	2010[e]	2011[e]	2012	2013
INDUSTRIAL MINERALS						
Cement:						
Hydraulic	thousand metric tons	1,800	1,500	1,500	1,600 [e]	1,700 [e]
Clinker	do.	500	500	500	500 [e]	500 [e]
Diamond[3, 4]	thousand carats	9,238	8,362	8,329	8,331	9,360
Fuller's earth		--	--	--	35,492	98,084
Granite	cubic meters	50,000	50,000	60,000	51,267 [r]	108,386
Gravel	thousand metric tons	--	--	--	533	938
Gypsum		120,000	200,000	200,000	121,981	189,242
Limestone:						
For cement manufacturing	thousand metric tons	--	--	--	--	882
For the construction industry	do.	--	--	--	1,100	1,442
Marble		--	--	--	13,900	1,800
Quartz		--	--	--	12,400	9,500
Salt		35,000	50,000	40,000	40,000	40,000 [e]
Sand:						
For the construction industry	thousand metric tons	--	--	--	743	881
Silica sand, for glass manufacturing		--	--	--	--	50,100
Stone, crushed	thousand metric tons	--	--	--	1,770	4,266
MINERAL FUELS AND RELATED MATERIALS						
Petroleum:						
Crude[4, 5]	thousand 42-gallon barrels	658,460	679,995	629,990	651,160	657,365
Refinery products[6]	do.	13,700	15,000	15,180 [4]	21,900	22,000 [e]

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. do. Ditto. -- Zero.

[1]Table includes data available through December 30, 2014.

[2]In addition to the commodities listed, gold was also produced by artisanal miners, but information was inadequate to make reliable estimates of output.

[3]Production was approximately 90% gem quality and 10% industrial grade. Source: Kimberley Process Certification Scheme.

[4]Reported figure.

[5]Source: BP p.l.c.

[6]Includes asphalt and bitumen.

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TABLE 2
ANGOLA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Cement		Companhia de Cimento do Lobito S.A. (TecnoSecil Investimentos e Participações SARL, 51%, and Government, 49%)	Lobito, Benguela Province	250,000.
Do.		Nova Cimangola S.A. (Government, 89%, and private investors, 11%)	Luanda	1,600,000; 540,000 clinker.
Do.		Cimenfort (Genea Group Angola)	Catumbela, central Benguela Province	720,000.
Diamond	thousand carats	Associação em Participação Chitotolo [Empresa Nacional de Diamantes de Angola (ENDIAMA), 45%; ITM Mining Ltd., 40%; LUMANHE Lda., 15%]	Chitotolo alluvial mine, 95 km southeast of Dundo	28.
Do.	do.	Empresa Nacional de Diamantes de Angola E.P. (ENDIAMA), 51%; New Millenium Resources Ltd., 34%; Mombo Lda., 15%	Rio Lapi Mine, 45 km northeast of Saurimo, Lunda Sul Province	240.
Do.	do.	Luó-Sociedade Mineira do Camatchia-Camagico [Empresa Nacional de Diamantes de Angola E.P. (ENDIAMA) and Espirito Santo Group]	Camatchia-Camagico Mine, Lunda Norte Province	18.
Do.	do.	Sociedade de Desenvolvimento Mineiro de Angola S.A.R.L. (SDM) [Empresa Nacional de Diamantes de Angola E.P. (ENDIAMA), 50%, and Odebrecht Mining Services Inc., 50%]	Luzamba alluvial mine, Cuango Valley, Lunda Norte Province	70.
Do.	do.	Sociedade Mineira de Catoca Lda. [Empresa Nacional de Diamantes de Angola E.P. (ENDIAMA), 32.8%; ALROSA S.A., 32.8%; Daumonty Financing Co. B.V., 18%; Odebrecht Mining Services Inc., 16.4%]	Catoca kimberlite mine, 36 km south of Saurimo, Lunda Sul Province	6,800.
Do.	do.	Sociedade Mineira do Cuango [Empresa Nacional de Diamantes de Angola E.P. (ENDIAMA), 41%; ITM Mining Ltd., 38%; LUMANHE Lda., 21%]	Cuango alluvial mine, Cuango Valley, Lunda Norte Province	31.
Do.	do.	Sociedade Mineira do Lucapa Ltd. [Empresa Nacional de Diamantes de Angola E.P. (ENDIAMA), 51%, and Sociedade Portuguesa de Empreendimentos, 49%]	Mufuto Norte alluvial mine	25.
Do.	do.	Sociedade Mineira do Lucapa Ltd. (SME) [Empresa Nacional de Diamantes de Angola E.P. (ENDIAMA), 51%, and Sociedada Portuguesa de Empreendimentos, 49%]; LUMANHE Lda.; ITM Mining Ltd.	Calonda alluvial mine, Lucapa, Lunda Norte Province	27.
Do.	do.	Trans Hex Group Ltd., 35%, and Empresa Nacional de Diamantes de Angola E.P. (ENDIAMA), 40%	Fucauma Mine, northeastern Angola	120.
Do.	do.	Trans Hex Group Ltd., 32%, and Empresa Nacional de Diamantes de Angola E.P. (ENDIAMA), 40%	Luarica Mine, northeastern Angola	90.
Do.	do.	Sociedade Mineira, S.A. Angola (Kwanza) [Trans Hex Group Ltd., 33%]	Somiluana Mine, 1,000 km northeast of Luanda, Lunda Norte Province	46.
Do.	do.	Artisanal miners	Lunda Norte, Lunda Sul, Moxico, Bie, and Malanje Provinces	NA.
Granite	cubic meters	Angostone, 100%	Lubango, Huíla Province	14,000.
Do.	do.	Coreangol, 100%	Nzeto municipality, Zaire Province	35,000.
Do.	do.	Emanha, 100%	Lubango, Huila Province	80,000.
Do.	do.	Rodang, 100%	do.	6,300.
Do.	do.	Metarochas, 100%	do.	2,200.

See footnotes at end of table.

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TABLE 2—Continued
ANGOLA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Gypsum	thousand metric tons	Fábrica de Gesso do Sumbe	Gypsum plant, Sumbe, Cuanza Sul Province	200.
Petroleum	thousand 42-gallon barrels per day	BP p.l.c., 50%, and Sonangol-Sinopec International, 50%	Block 18, offshore	240.
Do.	do.	Sonangol Pesquisa & Produção (Sonangol P&P), 100%	Block 3, Canuku field, offshore	NA.
Do.	do.	Chevron Corp., 31%; Sonangol Pesquisa & Produção (Sonangol P&P), 20%; Eni S.p.A., 20%; Total S.A., 20%; Petrogal, 9%	Block 14, offshore	100.
Do.	do.	Esso Exploration Angola, 40%; BP p.l.c., 26.67%; Eni S.p.A., 20%; Statoil ASA, 13.33%	Block 15, offshore	700.
Do.	do.	Sociedade Nacional de Combustíveis de Angola (Sonangol), 41%; Chevron Corp., 39.2%; Total S.A., 10%; Eni S.p.A., 9.8%	Block 0, Areas A, B, offshore Cabinda	340.
Do.	do.	Sonangol Pesquisa & Produção (Sonangol P&P), 25%; Petróleo Brasileiro S.A., 27.5%; Chevron Corp., 20%; Sociedade Petrolífera Angolana (Somoil), 9.3%; Poliedro Oil Co., 9.1%; Kotoil S.A., 9.1%	Block 2/85, offshore	NA.
Do.	do.	Sonangol Pesquisa & Produção (Sonangol P&P), 25%; China Sonangol, 25%; Angola Japan Oil Co. Ltd., 20%; Eni S.p.A., 12%; Sociedade Petrolífera Angolana (Somoil), 10%; NAFTGAS, 4%; Ina-Industrija Nafte, 4%	Block 3/05, Bufalo, Impala, Impala SE Pacassa, and Palanca fields, offshore	NA.
Do.	do.	Total S.A., 50%; Eni S.p.A., 15%; Angola Japan Oil Co. Ltd, 12.5%; Sociedade Nacional de Combustíveis de Angola (Sonangol), 6.25%; Svenska Petroleum Exploration AB (Svenska), 6.25%; Ina-Industrija Nafte, 5%; NAFTAGAS, 5%	Block 3/91, Oombo field, offshore	NA.
Do.	do.	Total S.A., 40%; Statoil ASA, 23.33%; Esso Exploration Angola, 20%; BP p.l.c., 16.67%	Block 17, offshore	700.
Do.	do.	Sociedade Nacional de Combustíveis de Angola (Sonangol), 80%; Sociedade Petrolífera Angolana (Somoil), 15%; Sonangol Pesquisa & Produção (Sonangol P&P), 5%	Block FS, onshore	NA.
Do.	do.	Sociedade Nacional de Combustíveis de Angola (Sonangol), 63.67%; Chevron Corp., 16.33%; Sociedade Petrolífera Angolana (Somoil), 15%; Sonangol Pesquisa & Produção (Sonangol P&P), 5%	Block FST, onshore	NA.
Petroleum refinery products	42-gallon barrels per day	Luanda refinery [Sonangol Pesquisa & Produção (Sonangol P&P), 100%]	Petroleum refinery, Luanda	51,000.
Do.	do.	Sociedade Nacional de Combustíveis de Angola (Sonangol), 100%	Malongo topping plant, Cabinda Province	12,500.

Do., do. Ditto. NA Not available.
[1]Abbreviations used for units of measure include the following: km kilometer.

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The Mineral Industries of Benin, The Gambia, Guinea-Bissau, and Sao Tome e Principe

By Philip M. Mobbs[1]

BENIN

Mining did not play an important role in Benin's economy. The country produced mostly industrial minerals, which included cement, clay, limestone, marble, and sand and gravel. Gold was also produced in small quantities by artisanal miners. In 2013, Minergy Metals BVI Ltd., which was a subsidiary of Minergy Resources Ltd. of India, was exploring the Loumbou-Loumbou and the Madekali iron ore deposits. The iron ore deposits have been explored intermittently since the 1940s, most recently by subsidiaries of Earthstone Holdings Ltd. of Indonesia and by Neo Global Trading LLC of Canada. Information on mineral production, with the exception of cement, was inadequate to make reliable estimates of output (tables 1 and 2). Data on cement production are in table 1.

THE GAMBIA

Mining did not play an important role in The Gambia's economy. Mineral output was limited to the intermittent production of industrial minerals, such as clay, ilmenite, silica sand, and zircon, but the available data were inadequate to make reliable estimates of output. In recent years, several international petroleum companies have explored for crude oil offshore. Petroleum exploration was expected to continue in 2014.

GUINEA-BISSAU

Mineral production in Guinea-Bissau was limited to small-scale production of industrial minerals, such as clay, granite, limestone, and sand and gravel, but available data were not sufficient to estimate the level of output of these commodities. BG Minerals Ltd. of Canada (formerly Plains Creek Phosphate Corp.) continued work on the development of the Farim phosphate rock project, which is located in north-central Guinea-Bissau about 120 kilometers northeast of Bissau.

SAO TOME E PRINCIPE

Mining did not play an important role in Sao Tome e Principe's economy. Mineral production was limited to clay and volcanic rock, but information was inadequate to make reliable estimates of output for these commodities. Exploration for petroleum in the Joint Development Zone, which comprised offshore acreage in an area that straddled the maritime border between Nigeria and Sao Tome e Principe, had returned noncommercial results since the initial well was drilled in 2006. The country's other deepwater territory (the Exclusive Economic Zone) remained undrilled (Siebert, 2013).

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[1]Deceased.

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TABLE 1
BENIN: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]	2009	2010	2011	2012	2013
Cement, hydraulic	1,315	1,305	1,460	1,390	1,422

[1]Table includes data available through January 12, 2015.
[2]In addition to the commodity listed, clay, gold, limestone, marble, and sand and gravel were produced, but available information is inadequate to make reliable estimates of output.

TABLE 2
BENIN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Cimbenin S.A. (HeidelbergCement AG, 52.51%, through its subsidiary Scancem International SA)	Cotonou plant	300,000
Do.	Onigbolo Cement Co. (OCC) (Dangote Industries Ltd., 43%, and Société des Ciments du Benin, 51%)	Onigbolo plant	600,000
Do.	Société des Ciments du Benin (Government, 50%, and LaFarge Group, 50%)	do.	700,000

Do., do. Ditto.

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The Mineral Industry of Botswana

By Thomas R. Yager

In 2013, Botswana was the world's leading producer of diamond by value, accounting for 26% of the value of global mined diamond production. Botswana's share of the world's mined diamond production by volume was 18%, and soda ash production, 2%. The country also produced coal, cobalt, copper, gold, nickel, platinum-group metals (PGMs), salt, sand and gravel, semiprecious gemstones, and silver. Botswana was not a globally significant consumer of minerals or mineral fuels in 2013 (Dolley, 2014; Janse, 2014).

Minerals in the National Economy

In 2013, the mining and quarrying sector accounted for 22.4% of the gross domestic product and the manufacturing sector, 5.2%. Formal employment in the mining and quarrying sector was reported to be about 11,840 workers in 2012 (the latest year for which data were available) (Bank of Botswana, 2014, p. S.8, S.26–S.27).

In 2013, national exports were valued at $7.69 billion, of which diamond accounted for about 82%; copper and nickel, 7.1%; and soda ash, 1.1%. National imports were valued at $7.61 billion in 2013, of which diamond (mostly rough diamond) accounted for about 28%; fuels, 17.2%; metal and metal products, 4.7%; and salt, ores, and related products, 1.9% (Bank of Botswana, 2014, p. S.81–S.84, S.86).

Production

In 2013, Botswana's silver production increased by 161%; mined copper, by 43%; salt, by 34%; cobalt and mined nickel, by 27% each; smelted copper, by 21%; and diamond, by 13%. Platinum production decreased by 50%; palladium, by 49%; and gold, by 21% (table 1).

Structure of the Mineral Industry

The Government maintained an equity position in most of the major mining companies; however, the mineral industry operated mainly on a free-market basis. Cement, cobalt, copper, diamond, gold, nickel, PGMs, salt, silver, and soda ash were produced by large-scale mines. The mineral industry also consisted of a number of small-scale mines and artisanal operations that produced agate, aggregates, bricks, dimension stone, and gold. Capacity, location, ownership, and production information were not readily available for these operations. Major commodities and the companies that produced those commodities are listed in table 2.

Commodity Review

Metals

Copper and Silver.—Bamangwato Concessions Ltd. (BCL) mined copper at its Selebi-Phikwe copper and nickel mines; the company smelted copper from its mining operations and the Phoenix Mine. In 2013, smelted copper production increased to 21,300 metric tons (t) from 17,625 t in 2012. BCL signed an agreement with Botswana Metals Ltd. (BML) of Australia to explore for copper at the Airstrip and the Dieate projects (table 1; Paull, 2013).

Tati Nickel Mining Co. (Pty) Ltd. (TNMC) operated the Phoenix Mine. In 2013, TNMC's copper production at the Phoenix Mine decreased to 5,412 t from 10,292 t in 2012 because of lower ore grades (Murray, 2014).

In 2013, Discovery Metals Ltd. produced 18,274 t of copper in concentrate at the Boseto project compared with about 5,750 t in 2012 as the company had its first full year of mining. Silver output increased to 22,590 kilograms (kg) from 8,670 kg in 2012 (Discovery Metals Ltd., 2013a, p. 1; 2013b; 2014).

The Boseto Mine was expected to have an initial design capacity of about 36,000 metric tons per year (t/yr) of copper and 34,000 kilograms per year (kg/yr) of silver in concentrate. In the fourth quarter of 2013, Discovery Metals started to review the feasibility study on the Zeta underground mine, which could increase capacity at Boseto to 50,000 t/yr (Lanham, 2012; Discovery Metals Ltd., 2014).

African Copper plc of the United Kingdom (Zambia Copper Investments Ltd. of Bermuda, 84%) operated the Thakudu open pit mine and the Mowana processing plant. The company produced 9,496 t of copper in concentrate in fiscal year 2013 compared with 6,910 t in fiscal year 2012 (African Copper plc, 2013).

In mid-2012, Hana Mining Ltd. of Canada completed a preliminary economic assessment of a new mine at the Ghanzi copper and silver project. The study yielded favorable results for a mine that would produce 30,100 t/yr of copper and 27,300 kg/yr of silver during an estimated life of at least 13 years. In March 2013, Cupric Canyon Capital LP (CCC) of the United States purchased Hana. CCC planned to complete a feasibility study on Ghanzi in 2014 (Murray, 2013).

Gold.—In 2013, Galane Gold Ltd. of Australia produced 1,206 kg of gold at the Mupane Mine compared with 1,522 kg in 2012. Mining was likely to cease at Mupane in 2014. Galane planned to mine 1 million metric tons (Mt) of ore at a grade of 1.71 grams per metric ton (g/t) from the nearby Golden Eagle deposit by the end of 2015 and 1 Mt at a grade of 2.6 g/t by 2018 from the new underground Tau Mine. The company also planned to produce gold by re-treating tailings (Murray, 2014).

Nickel and Platinum-Group Metals.—BCL mined nickel at its Selebi-Phikwe copper and nickel mines. The company

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smelted nickel from its mining operations and the Phoenix Mine. In 2013, smelted nickel production decreased to 21,900 t from 24,000 t in 2012. BCL signed an agreement with BML to explore for nickel and copper at the Maibele North project (table 1; Paull, 2013).

In 2013, TNMC's nickel production at the Phoenix Mine decreased to 6,416 t from 12,215 t in 2012 because of lower ore grades. Palladium production also decreased to 1,337 kg in 2013 from 2,613 kg in 2012, and platinum production, to 218 kg from 435 kg (MMC Norilsk Nickel, 2014; Murray, 2014).

Industrial Minerals

Diamond.—In 2012, the distribution arm of De Beers Group moved its operations to a new sorting center in Gaborone from where it shipped its products worldwide. The Government of Botswana established a new diamond trading company named the Okavango Diamond Trading Co., which was wholly owned by the Government. Okavango was to be responsible for marketing the Government's portion of Debswana Diamond Co. (Pty) Ltd.'s production. Under the Government's agreement with De Beers, Okavango had the right to market 12% of Debswana's production in 2013; its share would increase to 15% by 2016 (African Mining, 2013b).

Botswana's diamond trade increased as it became established as De Beers' new sorting center. The value of Botswana's rough diamond production was estimated to be $3.75 billion in 2013, most of which was exported before any cutting and polishing. In 2013, rough diamond exports totaled $5.52 billion, of which $3.39 billion was reported to be from domestic production (domestic exports may include some reexports from other countries). In 2012, rough diamond exports totaled $4.02 billion, of which $3.06 billion was reported to be from domestic production. Imports of rough diamond from such counties as Canada, Namibia, and South Africa were valued at $2.04 billion in 2013 compared with $2.09 billion in 2012; most of the rough diamond imports were exported before any cutting and polishing was done (Bank of Botswana, 2014, p. S.82–S.83; Janse, 2014).

Debswana produced more than 22.7 million carats at the Damtshaa, the Jwaneng, the Letlhakane, and the Orapa Mines in 2013 compared with 20.2 million carats in 2012. In 2013, production at Orapa increased to 11.4 million carats from 11.1 million carats in 2012; at Jwaneng, to 10.4 million carats from 8.17 million carats; and at Damtshaa, to 260,000 carats from about 200,000 carats. Output at Letlhakane decreased to 682,000 carats in 2013 from about 760,000 carats in 2012. Increased production at Jwaneng was attributable to recovery from the collapse of a pit wall in mid-2012 (Janse, 2013; Murray, 2014).

Debswana's production for 2014 was expected to be more than 24 million carats, which included 12.8 million carats at Orapa. The Jwaneng Cut-8 project was likely to extend the life of the Jwaneng Mine to at least 2028 and allow an additional 95 million carats of diamond to be mined (Murray, 2013, 2014).

Lucara Diamond Corp. of Canada operated the Karowe Mine, which produced diamond from the AK6 kimberlite project. Lucara mined about 441,000 carats at Karowe in 2013 compared with 303,100 carats in 2012 and 14,800 carats in 2011. Production was expected to be about 460,000 carats in 2014 (Janse, 2013, 2014; Ziminsky, 2014).

Mantle Diamonds Ltd. of the United Kingdom held the Lerala Mine, which was on care-and-maintenance status in 2013. Between February and July 2012, the company mined more than 73,000 carats of diamond at Lerala. In September 2013, Kimberley Diamonds Ltd. of Australia purchased Mantle. Kimberley planned to reopen Lerala in 2014 and to produce more than 400,000 carats per year during the estimated 7-year life of the mine. Reserves were estimated to be 20.6 Mt of ore that contained nearly 5.6 million carats (Kimberley Diamonds Ltd., 2013).

Gem Diamonds Ltd. of the United Kingdom started construction on the new Ghaghoo Mine in 2011; the company planned to start mining in 2013. The planned opening of the mine was delayed until August 2014 by heavy rains. Gem Diamonds planned to produce about 200,000 carats per year at Ghaghoo in the first phase of mining. Indicated resources at Ghaghoo were estimated to be about 15.5 million carats of contained diamond (Janse, 2013; Moodley, 2013; Murray, 2013).

Pangolin Diamonds Corp. of Canada explored for diamond at Tsabong North in southwestern Botswana in 2013. Botswana Diamonds plc of the United Kingdom explored for diamond near Gope. Firestone Diamonds plc's BK11 Mine remained on care-and-maintenance status in 2013 (Murray, 2013).

In 2013, Botswana had 25 diamond cutting and polishing companies that employed nearly 3,000 workers. National net exports of polished diamond were valued at $700 million in 2013 compared with $655 million in 2012. The growth of Botswana's diamond cutting and polishing industry was limited by high production costs, which were about $60 per carat compared with between $15 and $20 per carat in India and $25 per carat in China (Shor, 2013; Bank of Botswana, 2014, p. S.82–S.83).

Potash, Salt, and Soda Ash.—Botswana Ash (Pty.) Ltd. (BotAsh) had the capacity to produce 650,000 t/yr of salt and 300,000 t/yr of soda ash at Sua Pan. The company's soda ash production decreased to 227,913 t in 2013 from a revised 248,629 t in 2012. In December, BotAsh signed an agreement with Great Quest Metals Ltd. of Canada to evaluate the recovery of potash from the brines, BotAsh's mine effluent, and historical mine tailings (Great Quest Metals Ltd., 2013).

Mineral Fuels and Related Materials

Coal.—In 2013, production at the Morupule Mine increased to nearly 1.5 Mt of coal from 1.45 Mt in 2012 and 0.79 Mt in 2011. In 2012, Morupule Colliery (Pty) Ltd. completed an expansion of the mine's capacity to 3.2 million metric tons per year (Mt/yr) from 1 Mt/yr. The company's production was limited by fluctuating demand from Botswana Power Corp. Coal from Morupule was planned to be used in the new Morupule B power station. Morupule B, which had a planned capacity of 528 megawatts (MW), was expected to open in 2014 (Murray, 2013, 2014).

African Energy Resources Ltd. of Australia was engaged in an environmental impact assessment of a new mine at the Sese project, which had resources of 2.5 billion metric tons (Gt) of coal. The company completed feasibility studies with favorable

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results on a new mine, a new 300-MW-capacity coal-fired power station, and railways for coal exports. African Energy planned to produce about 2 Mt/yr of coal for export and between 1.5 and 2 Mt/yr for consumption in the domestic power station. Mining could start at Sese in 2016 (Murray, 2013; Williams, 2013).

In 2013, African Energy acquired the Mmamantswe coal project, which had resources of 1.3 Gt, from Aviva Corp. Ltd. of Australia. The company planned to produce 2.5 Mt/yr of lower quality coal at Mmamantswe for consumption in a new domestic power station and 2.5 Mt/yr of higher quality coal for export. African Energy planned to start construction on the power station, which would have a capacity of between 300 and 400 MW, by the end of 2014 (Williams, 2013).

Hodges Resources Ltd. of Canada completed a scoping study with favorable results on a new mine at the Morupule South project. In the first phase, production would be between 2 and 3 Mt/yr, all of which would be consumed in domestic and regional power stations. After 5 years, the mine would produce 5 Mt/yr in the second phase, of which 2 Mt/yr would be exported. Hodges planned to complete a feasibility study by early 2014. Resources at Morupule South were estimated to be 2.45 Gt (International Resource Journal, The, 2013; Murray, 2013).

Jindal BVI Ltd. of India was considering the development of a new mine at the Mmamabula project. The mine would produce 4.5 Mt/yr of coal that would be consumed in a new power station. The company could start production in 2016. Resources at Mmamabula were estimated to be 2.4 Gt (Murray, 2013; KPMG Global Mining Institute, 2014, p. 26).

Walkabout Resources Ltd. of Australia held the Takatokwane project, which had indicated resources of 748 Mt and inferred resources of 6.9 Gt. The company was considering the development of a new mine at Takatokwane that could produce as much as 5 Mt/yr. Higher quality coal would be exported and lower quality coal would be used in a domestic coal-to-liquids plant. Walkabout signed an agreement with Coalswana (Pty) Ltd., in which Coalswana would fund feasibility studies on the Takatokwane project in return for offtake rights on the mine's production (Murray, 2013; Australia's Paydirt, 2014).

A-Cap Resources Ltd. of Australia was engaged in a scoping study on a new mine at its Mea project, which had resources of 335 Mt. The company planned to complete the study in the first quarter of 2014. In May, A-Cap estimated that coal resources associated with the uranium deposits at Letlhakane were 107 Mt (A-Cap Resources Ltd., 2014, p. 6–7).

Natural Gas.—In 2013, Tlou Energy Ltd. of Australia estimated that resources of natural gas at its Lesedi coal bed methane (CBM) project were 65 billion cubic meters. Tlou planned a drilling program at Lesedi in early 2014. Magnum Gas & Power Ltd. of Australia drilled at two of the blocks in its Central CBM project in 2013; the company planned to drill at two other blocks in the Central CBM project in the first half of 2014. By mid-2015, Magnum hoped to start a feasibility study on the project. Origin Energy Ltd. of Australia and Sasol Ltd. of South Africa were also engaged in a joint venture to explore for CBM in 2013 (Barich, 2014).

Uranium.—In February 2013, A-Cap completed a scoping study on a new mine at the Letlhakane uranium project. The study yielded favorable results for a mine that would produce about 1,360 t/yr of uranium oxide (U_3O_8) during an estimated 20-year life. Depending on the results of further studies, A-Cap could start production at Letlhakane by 2017. Resources were estimated to be nearly 160,000 t of contained U_3O_8 (African Mining, 2013a).

Outlook

Botswana's mining sector is likely to grow in the near future. Mined diamond production is expected to increase between 2014 and 2016; copper and silver production, between 2016 and 2018; and coal production, between 2014 and 2018. Uranium production could start in 2017. The production of cut and polished diamond also is likely to increase; growth could be constrained to specialty markets by high production costs. The growth in coal production could be constrained by limited rail capacity.

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TABLE 1
BOTSWANA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
Cement[e]		250,000	260,000	260,000	260,000	260,000
Clay, brick[e]		170,000	170,000	170,000	170,000	170,000
Coal, bituminous		737,798	988,240	787,729	1,454,724	1,495,653
Cobalt, smelter output, Co content of matte[3]		342	272	149	195	248
Copper:						
Mine output, Cu content of ore milled[4]		28,595	48,026	31,929	35,768	51,254
Smelter output, matte, gross weight[3]		NA [r]	NA [r]	NA [r]	NA [r]	NA
Smelter output, Cu content of matte[3]		24,382 [r]	22,823 [r]	16,105 [r]	17,625 [r]	21,300
Diamond[5]	thousand carats	17,734	22,019	22,903	20,550 [r]	23,190
Gemstones, semiprecious[e, 6]	kilograms	72,000 [r, 7]	75,000 [r]	80,000 [r]	85,000 [r]	90,000
Gold[8]	do.	1,626	1,774	1,562 [r]	1,522 [r]	1,206
Nickel:						
Mine output, Ni content of ore milled[4]		28,595	24,931 [r]	15,675	17,948	22,848
Smelter output, matte, gross weight[3]		54,000	53,000	53,000	52,000	52,000
Smelter output, Ni content of matte[3]		27,900 [r]	25,100 [r]	28,800 [r]	24,000 [r]	21,900
Platinum-group metals:						
Palladium	kilograms	3,452	3,328	2,115	2,613	1,337
Platinum	do.	622	560	373	435	218
Salt[9]		241,114	364,761	446,525	389,481 [r]	521,306
Silver	kilograms	--	--	--	8,670	22,597
Soda ash, natural		215,118	240,898	257,851 [r]	248,629 [r]	227,913

[e]Estimated; estimated data are rounded to more than three significant digits. [r]Revised. do. Ditto. NA Not available. -- Zero.
[1]Table includes data available through December 19, 2014.
[2]Silver was produced and exported in the nickel, copper, and cobalt matte. Dimension stone and sand and gravel also were produced, but information was inadequate to estimate output.
[3]Smelter product was granulated nickel, copper, and cobalt matte.
[4]Includes some product from direct smelting ore; that is, ore not reported as milled.
[5]Assumed to contain about 70% gem and near gem.
[6]Principally agate.
[7]Reported figure.
[8]Reported as bullion; historically included silver estimated to be about 2%.
[9]Byproduct of natural soda ash production.

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TABLE 2
BOTSWANA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Portland Pretoria Cement Botswana (Pty) Ltd.	Plant at Gaborone	400,000.
Do.		Matsiloje Portland Cement Co.	Plant at Matsiloje, 45 kilometers southeast of Francistown	36,000.
Clay[1]		Makoro Brick and Tile (Pty.) Ltd.	Makoro, 10 kilometers south of Palapye	100,000.[e]
Do.		Lobatse Clay Works (Pty.) Ltd. (Botswana Development Corp. and Interkiln Corp. joint venture)	Lobatse, 70 kilometers south-southwest of Gaborone	70,000.[e]
Coal		Morupule Colliery (Pty) Ltd. [Debswana Diamond Co. (Pty.) Ltd., 100%]	Morupule Mine, 14 kilometers west of Palapye	3,200,000.
Diamond	thousand carats	Debswana Diamond Co. (Pty.) Ltd. (Government, 50%, and De Beers Centenary AG, 50%)	Jwaneng Mine near Jwaneng	12,000.
Do.	do.	do.	Orapa Mine near Oropa	13,000.
Do.	do.	do.	Letlhakane Mine near Letlhakane	1,000.
Do.	do.	do.	Damtshaa Mine, 220 kilometers west of Francistown	670.
Do.	do.	Lucara Diamond Corp.	Karowe Mine in Boteti Sub-District	460.[e]
Do.	do.	Kimberley Diamonds Ltd.	Lerala Mine near Lerala[2]	400.
Gemstones, semiprecious	kilograms	Agate Botswana (Pty.) Ltd.	Processing plant at Pilane, 45 kilometers north of Gaborone	70,000.[e]
Do.	do.	Masa Semi-Precious Stones (Pty.) Ltd.	Bobonong, east of Selebi-Phikwe	20,000.[e]
Gold	do.	Galane Gold Ltd.	Mupane Mine, 30 kilometers southeast of Francistown	2,000.
Nickel, copper, and cobalt		Bamangwato Concessions Ltd. (BCL), (Government, 94%, and OJSC MMC Norilsk Nickel, 6%)	Selebi-Phikwe Mines, 350 kilometers northeast of Gaborone	3,000,000 ore matte content (of which 30,000 nickel, 25,000 copper, 400 cobalt).
Do.		Tati Nickel Mining Co. (Pty.) Ltd. (OJSC MMC Norilsk Nickel, 85%, and Government, 15%)	Phoenix and Selkirk Mines, 23 kilometers east of Francistown	5,000,000 ore matte content (of which 21,000 nickel, 12,500 copper, 800 cobalt, 4,400 kilograms palladium, 700 kilograms platinum).
Do.		Discovery Metals Ltd.	Boesto Mine	36,000 copper.
Do.		African Copper plc (Zambia Copper Investments Ltd., 84%)	Thakudu Mine	10,000[e] copper.
Salt		Botswana Ash (Pty.) Ltd. (BotAsh) (Government, 50%, and Chlor Alkali Holdings, 50%)	Sua Pan, 450 kilometers north of of Gaborone	650,000.
Silver	kilograms	Discovery Metals Ltd.	Boesto Mine	34,000.
Soda ash		Botswana Ash (Pty.) Ltd. (BotAsh)	Sua Pan	300,000.

[e]Estimated. Do., do. Ditto.
[1]For brick and tiles.
[2]Not operating at the end of 2013.

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The Mineral Industry of Burkina Faso

By Omayra Bermúdez-Lugo

Gold continued to be Burkina Faso's most valuable mineral commodity in terms of its contribution to the country's gross domestic product (GDP) and to Government revenues. In 2013, the country ranked fifth among Africa's leading gold producers. The International Monetary Fund estimated that gold production from six of the country's seven industrial gold mines, together with production from small-scale and artisanal gold miners, accounted for about 71% of the country's total exports by value in 2013 and for about 16% of Government revenues. Artisanal gold production, however, was thought to be underreported. Mining taxes and royalties from industrial gold mining operations accounted for about 65% of reported Government revenues. The mineral sector as a whole, however, accounted for only 4.3% of the GDP in 2013 (International Monetary Fund, 2014, p. 4, 22–23, 26).

Other mineral commodities produced in the country included cement, lead, manganese, silver, and zinc. Industrial minerals, such as dolomite, granite, marble, phosphate rock, salt, and sand and gravel, were also produced, but information was inadequate to make reliable estimates of output. Burkina Faso was a participant in the Extractive Industries Transparency Initiative (EITI) and has been compliant with EITI standards since it became a candidate country in 2009 (Extractive Industries Transparency Initiative, 2014).

The draft of a new mining code was pending Government approval. The Burkina Faso Chamber of Mines reported that the decrease in the international price of gold had caused a slowdown in gold exploration activities in the country in 2013, as companies struggled to secure funding for mining projects. Gold output, however, increased by 13%, mostly as a result of the commissioning of the Bissa Mine, which began production on January 17. The Bissa Mine produced about 7,900 kilograms of gold during the year. The Perkoa zinc mine was also commissioned in January and, in October, the first shipment of zinc concentrate was transported by truck from the mine to the Port of Abidjan in Côte d'Ivoire from where it was then exported. The Perkoa Mine's joint-venture partners, Blackthorn Resources Ltd. of Australia and GlencoreXstrata plc. of Switzerland, were in the process of securing additional funding for further development of the mine. About 32,200 metric tons of zinc was produced at the Perkoa Mine in 2013 (Blackthorn Resources Ltd., 2013; Chambre des Mines du Burkina, 2014, p. 6; Nord Gold N.V., 2014, p. 7).

Table 1 provides data on the principal mineral commodities produced in Burkina Faso from 2009 to 2013, and table 2 provides a list of major mineral industry facilities in 2013. More-extensive coverage of the mineral sector of Burkina Faso can be found in the 2011 and 2012 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available at http://minerals.usgs.gov/minerals/pubs/country/.

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TABLE 1
BURKINA FASO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
Cement		563,406	587,014	590,000 e	658,595 r	579,928
Gold[3]	kilograms	11,581	22,939	31,774	28,939 r	32,714
Lead:						
Pb concentrate produced from ore (45% Pb)		--	--	--	--	2,236
Pb content of concentrate		--	--	--	--	1,017
Manganese:						
Ore, processed		--	57,355	49,715	50,000 e	50,000 e
Mn content e		--	25,800	22,400	24,800 r	22,500
Silver, Ag content of Pb concentrate	kilograms	--	--	--	--	14,541
Zinc:						
Zn concentrate produced from ore (50% to 51% Zn)		--	--	--	--	63,648
Zn content of concentrate		--	--	--	--	32,215

eEstimated; estimated data are rounded to no more than three significant digits. rRevised. -- Zero.

[1]Table includes data available through January 29, 2015.

[2]In addition to the commodities listed, dolomite, granite, marble, phosphate rock, salt, sand and gravel and other construction materials are produced, but information is inadequate to make reliable estimates of output.

[3]Does not include production from artisanal mining, which is estimated to be between 1,000 and 10,000 kilograms per year.

TABLE 2
BURKINA FASO: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Diamond Cement Burkina S.A. (West African Cement S.A.)	Ouagadougou	700,000.
Gold	kilograms	Société des Mines de Bélahouro S.A. (Avocet Mining plc, 90%, and Government, 10%)	Inata Mine, 220 kilometers north of Ouagadougou	5,200.
Do.	do.	Burkina Mining Company S.A. (Endeavour Mining Corp., 90%, and Government, 10%)	Youga Mine, 180 kilometers southeast of Ouagadougou	3,100.
Do.	do.	Essakane S.A. (IAMGOLD Corp., 90%, and Government, 10%)	Essakane Mine, 330 kilometers northeast of Ouagadougou	9,800.
Do.	do.	Kalsaka Mining S.A. (Amara Mining plc, 78%; IMARB Indústria Metalúrgica, 12%; Government, 10%	Kalsaka-Sega Mine, 150 kilometers west of Ouagadougou	2,300.
Do.	do.	Semafo Burkina Faso S.A. (Semafo Inc., 90%, and Government, 10%)	Mana Mine, 200 kilometers west of Ouagadougou	5,900.
Do.	do.	Société des Mines de Taparko S.A. (Nord Gold N.V., 90%, and Government, 10%)	Taparko-Boroum Mine, 200 kilometers northeast of Ouagadougou	4,100.
Do.	do.	Bissa Gold S.A. (Nord Gold N.V, 90%, and Government, 10%)	Bissa Mine, 85 kilometers north of Ouagadougou	8,000.
Do.	do.	Pinsapo Gold S.A. (Pinsapo Group AG)	Sassa-1 small-scale mine, Passore Province	NA.
Lead		GlencoreXstrata plc, 62.7%; Blackthorn Resources Ltd., 27.3%; Government, 10%	Perkoa Mine, 120 kilometers west of Ouagadougou	1,100.
Manganese		ACM Corp. (Burkina Manganèse S.A., 100%)	Kiere Mine, 10 kilometers northeast of Bobo-Dioulasso	60,000 ore.
Silver	kilograms	GlencoreXstrata plc, 62.7%; Blackthorn Resources Ltd., 27.3%; Government, 10%	Perkoa Mine, 120 kilometers west of Ouagadougou	15,000.
Zinc		do.	do.	32,300.

Do., do. Ditto. NA, Not available.

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The Mineral Industry of Burundi

By Thomas R. Yager

In 2013, Burundi was the world's seventh-ranked producer of tantalum; its share of global tantalum output was about 1%. The country also mined small amounts of gold, limestone, niobium (columbium), peat, sand and gravel, tin, and tungsten. Burundi was not a globally significant consumer of minerals. The manufacturing industry accounted for 11% of the gross domestic product in 2013, and the mining and quarrying industry, 0.6% (African Development Bank Group, 2014; Papp, 2015).

In October 2013, the Government passed the Mining Code of Burundi (Law No. 1/21 of October 15, 2013), which partially replaced the Mining and Petroleum Act of 1976 (Decree-Law No. 1/138 of July 17, 1976). The exploration for and mining of minerals and mineral fuels other than petroleum and natural gas were governed by the Mining Code of Burundi. At yearend, the natural gas and petroleum subsector still was governed by the Mining and Petroleum Act of 1976 (Karerwa, 2013).

The Mining Code set ad valorem royalty rates on mining companies with exploitation licenses at 7% for gemstones, 5% for precious metals, 4% for basic metals, and 2% for other minerals. Ad valorem royalty rates on quarries, artisanal miners, and authorized mineral traders were set at 3% for base metals, 2% for precious metals, 2% for gemstones, and 1.5% for other minerals (Karerwa, 2013).

The Mining Code required a simplified environmental impact study to be conducted for prospecting, exploration, artisanal mining, and quarrying licenses to be awarded and a full environmental impact study for exploitation licenses to be awarded. Companies holding exploitation licenses were also required to allow the Government to hold at least 10% ownership in their Burundian operations (Karerwa, 2013).

The Government attempted to formalize the artisanal mining sector by mandating in the Mining Code that all artisanal miners obtain a mining license. In March 2013, the Government also imposed a 2-month artisanal mining ban in an attempt to formalize the artisanal mining sector (United Nations Group of Experts, 2013, p. 35; U.S. Embassy, Bujumbura, Burundi, 2014).

In 2013, the Government was engaged in a pilot program to implement a system established by the International Conference on the Great Lakes Region (ICGLR) to certify and trace domestically mined cassiterite, columbite-tantalite, gold, and wolframite because of the reported use of minerals that were mined in the Democratic Republic of the Congo [Congo (Kinshasa)] and transited through Burundi to fund military operations. Congolese armed groups reportedly engaged in the illegal taxation of artisanal miners to fund their operations in Congo (Kinshasa) (Levin and Cook, 2013, p. 18).

Production

In 2013, cement production increased by an estimated 42%. The production of tin decreased by an estimated 98% in 2013; tungsten, by an estimated 79%; niobium (columbium), by an estimated 73%; and tantalum, by an estimated 72% (table 1; Ulrika Joyce, Economics Officer, U.S. Embassy, Bujumbura, Burundi, written commun., June 26, 2014).

Structure of the Mineral Industry

Employment in industrial minerals mining was estimated to be about 10,000 workers in 2009 (the latest year for which data were available); gold, 4,000 workers; niobium, tantalum, and tin combined, 2,000 workers; and tungsten, 1,600 workers. Muyinga Province accounted for about 33% of the artisanal miners employed in mining metals; Kayanza Province, 27%; Cibitoke Province, 24%; Kirundo Province, 10%; Ruyigi Province, 5%; and Bubanza Province, 1%. Privately owned African Mining Metallurgical Group of Russia and Comptoir Minier des Exploitations du Burundi S.A. (COMEBU) mined niobium and tantalum. State-owned Office Nationale de la Tourbe (ONATOUR) was Burundi's only peat producer (Midende, 2010, p. 51; World Bank, The, 2011, p. 48).

Commodity Review

Metals

Cobalt, Copper, and Nickel.—Resources at the undeveloped Musongati nickel-cobalt-copper deposits were estimated to be about 150 million metric tons (Mt) grading 1.31% nickel, 0.21% copper, and 0.09% cobalt. Burundi Mining Metallurgy International Ltd. (BMM) (a subsidiary of Kermas Group of the United Kingdom) could start mining at Musongati in 2014; nickel production could reach nearly 24,000 metric tons per year (t/yr) by 2019. The project was estimated to require power consumption of between 100 and 150 megawatts (MW) of capacity (Africa Mining Intelligence, 2011; Burundi Mining Metallurgy International Ltd., 2011, p. 68–69; Metal Bulletin, 2013).

In early 2013, the Government granted BMM approval to build a new hydroelectric power station to supply Musongati. Approval of the exploitation license to start construction of the mine was on hold until the Government completed its new mining code. At yearend, the exploitation license had not been issued; the extent of the delay to BMM's production plans was unclear (Metal Bulletin, 2013; Nkurunziza, 2014).

In August 2013, the Government granted World Sports Alliance Intergovernmental Organization (WAISO) research licenses for the Nyabikere and the Waga nickel laterite deposits. The Government subsequently issued exploitation licenses to WAISO for Nyabikere and Waga in October. Resources at Nyabikere were estimated to be 46 Mt at a grade of 1.45% nickel, and at Waga, 35 Mt at a grade of 1.38% nickel (Ruffini, 1998; Nkurunziza, 2013).

Gold.—Burundi's gold exports were 2,832 kilograms (kg) in 2013 compared with 2,046 kg in 2012. The majority of gold exports reportedly were re-exports from Congo (Kinshasa).

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Artisanal miners produced gold in Bubanza, Cibitoke, Kayanza, Kirundo, Muyinga and Ruyigi Provinces. Recovery rates from artisanal gold mining operations were estimated to be about 30% (African Development Bank Group, 2014; U.S. Embassy, Bujumbura, Burundi, 2014).

In early 2013, the Government granted Etablissement Jean Jbeili of Lebanon exclusive rights to refine all the gold produced in Burundi. The refinery, which was located in Bujumbura, was expected to start production in February 2014. Etablissement Jean Jbeili was also granted the right to process tailings from artisanal gold mining operations (U.S. Embassy, Bujumbura, Burundi, 2014).

Niobium (Columbium), Tantalum, Tin, and Tungsten.—Artisanal miners produced tin in cassiterite, niobium and tantalum in columbite-tantalite, and tungsten in wolframite from numerous mines in Kayanza, Kirundo, Muyinga, and Ngozi Provinces. In 2013, cassiterite production decreased to 3 metric tons (t) from 117 t in 2012; columbite-tantalite, to 74 t from 259 t; and wolframite, to 115 t from 565 t. Lower production may have been attributable to the 2-month mining ban imposed by the Government and decreased demand because of concerns about purchasing conflict minerals from Congo (Kinshasa) (Midende, 2010, p. 48; U.S. Embassy, Bujumbura, Burundi, 2014; Ulrika Joyce, Economics Officer, U.S. Embassy, Bujumbura, Burundi, written commun., June 26, 2014).

Industrial Minerals

Cement, Clay and Shale, and Gypsum.—In 2012, Burundi Cement Co. (BUCECO) produced 70,500 t of cement at its plant in Cibitoke Province compared with 34,500 t in 2011. BUCECO planned to produce at the plant's full capacity of 100,000 t/yr in 2013; the company was considering an increase in capacity to 200,000 t/yr. As of the end of 2013, it was unclear when the expansion would take place. The company quarried clay domestically and imported clinker and gypsum for use in cement production. All Burundi's cement requirements were imported before BUCECO started production in 2011; imports decreased to 112,515 t in 2012 from 142,364 t in 2011 (Burundi Cement Co., 2013; Banque de la Republique du Burundi, [undated], p. 88).

Mineral Fuels

Peat.—ONATOUR produced peat at Buyongwe, Gisozi, Gitanga, and Matana. In 2012, production increased to 20,335 t from 7,982 t in 2011 because of new mining equipment. In 2013, the company was producing peat at the rate of about 19,000 t/yr. Peat was consumed mostly by the Burundian military in spite of ONATOUR's relatively high production costs because of shortages of cheaper firewood and charcoal. The Government planned to complete a new peat-fired power station with a capacity of 200 MW by 2015 (East African Community Secretariat, 2012, p. 46; Madirisha, 2014; Banque de la Republique du Burundi, [undated], p. 13–14).

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TABLE 1
BURUNDI: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013[e]
Cement		--	--	34,500	70,500	100,000
Gold, mine output, Au content[e]	kilograms	500	300	300	400 [r]	400
Niobium (columbium) and tantalum, ore and concentrate:						
Gross weight	do.	44,207	67,365	158,782 [r]	258,578 [r]	73,518 [3]
Nb content[e]	do.	8,700	13,000 [r]	31,000 [r]	51,000 [r]	14,000
Ta content[e]	do.	8,600	13,000 [r]	31,000 [r]	50,000 [r]	14,000
Peat		11,352	13,111	7,982 [r]	20,335 [r]	19,000
Tin, mine output:						
Gross weight		20 [r]	29	52	117 [r]	3 [3]
Sn content[e]		9 [r]	12	22	50 [r]	1
Tungsten, mine output:						
Gross weight		333	328	505 [r]	565 [r]	115 [3]
W content[e]		110 [r]	100 [r]	160 [r]	180 [r]	37

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. do. Ditto. -- Zero.

[1]Table includes data available through October 27, 2014.

[2]In addition to the commodities listed, brick clay, limestone, and sand and gravel were produced, but available information was inadequate to make reliable estimates of output.

[3]Reported figure.

TABLE 2
BURUNDI: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Burundi Cement Co. (BUCECO)	Plant in Cibitoke Province	100,000
Gold	kilograms	Artisanal miners	At least 35 sites in Bubanza, Cibitoke, Kayanza, Kirundo, Muyinga, and Ruyigi Provinces	400 [e]
Niobium (columbium) and tantalum, columbite-tantalite ore and concentrate		Comptoir Minier des Exploitations du Burundi S.A. (COMEBU)	Kabarore in Kayanza Province	6 [e]
Do.		African Mining Metallurgical Group	Mine in Marangara Commune	NA
Do.		Artisanal miners	Various sites in Kayanza, Kirundo, Muyinga, and Ngozi Provinces	250 [e]
Peat		Office Nationale de la Tourbe (ONATOUR)	Buyongwe, Gisozi, Gitanga, and Matana	20,000
Tin, cassiterite ore and concentrate		Comptoir Minier des Exploitations du Burundi S.A. (COMEBU) and artisanal miners	Various sites in Cibitoke, Kayanza, Kirundo, Muyinga, and Ngozi Provinces	100 [e]
Tungsten, wolframite ore and concentrate		Artisanal miners	At least 10 sites in Kirundo and Muyinga Provinces	600 [e]

[e]Estimated. Do. Ditto. NA Not available.

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The Mineral Industry of Cabo Verde

By Philip M. Mobbs[1]

The mineral industry's contribution to the economy of Cabo Verde (formerly known as Cape Verde), which is an archipelago of 10 islands and 8 islets that are located about 600 kilometers off the western coast of Africa, was minimal. Cabo Verde's nominal gross domestic product was estimated to be $1.9 billion[1] in 2013 (International Monetary Fund, 2014).

Most of the country's mineral commodity needs were satisfied by imports. In 2013, the provisional value of total exports from Cabo Verde was about $201 million and the value of total imports was about $833 million. The value of imports of mineral fuels accounted for about 19% of Cabo Verde's total imports in 2013; cement, about 3%; and steel products, about 2%. Most of the imported cement and steel products were sourced from Portugal. Compared with those of 2012, imports of building materials declined in 2013 and imports of cement declined for the first half of the year but increased in the second half (Banco de Cabo Verde, 2014, p. 12, 14; United Nations Statistics Division, 2014).

Salt was recovered from the Saline de Pedra Lume, which is located in the crater of an extinct volcano on the island of Sal, and from the salt marshes of Porto Ingles on Maio Island. In 2013, an area of 535 hectares of the Salinas de Porto Ingles was added to the Ramsar list of wetlands of international importance. Artisanal production of salt was expected to continue. Historically, salt also had been produced at Curral Velho on the island of Boa Vista. Crude construction materials, such as aggregate and clay, were produced primarily to meet local demand. Cimpor Cabo Verde S.A., which was a subsidiary of Cimpor-Cimentos de Portugal SGPS, S.A., produced concrete and distributed imported cement. Mineral commodity production amounts were not reported, and available information was inadequate to make reliable estimates of output (table 1; Smith, 2010; Convention on Wetlands of International Importance, The, 2014).

Outlook

With four international airports and available nonagricultural land adjacent to sandy beaches, the archipelago is slowly making the transition to a tourist destination. Domestic mineral production is not expected to change in the near future, although imports of cement and steel could increase with additional housing and infrastructure construction. The potential increase in the transient population is expected to increase demand for electrical power and potable water. The separation of the islands limits the economies of scale associated with centralized desalination and electrical powerplants but enhances the attractiveness of supplementing the local power supply with electrical power generated by wind farms.

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[1]Deceased.

[2]Where necessary, values have been converted from Cabo Verdean Escudos (ECV) to U.S. dollars (US$) at the average rate of ECV81.95=US$1.00 for 2013.

TABLE 1
CABO VERDE: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aggregate	Cimpor Cabo Verde S.A. (Cimpor-Cimentos de Portugal. SGPS, S.A., 98.13%)	Quarries on Boa Vista, Sal, and Santiago	NA
Salt	Artisanal	Saline de Pedra Lume, Sal	NA
Do.	do.	Salinas de Porto Ingles, Maio	NA

Do., do. Ditto. NA Not available

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The Mineral Industry of Cameroon

By Philip M. Mobbs[1]

Mineral production, primarily aluminum and petroleum production and refining, was a small part of the economy of Cameroon. The country's nominal gross domestic product was estimated to be $28.3 billion in 2013, of which the oil sector represented about 3.5%. In 2013, the oil sector accounted for a major portion of total exports (about 52%) and was the source of about 27% of Government revenues (International Monetary Fund, 2014a, p. 21–22; b, p. 32).

Cameroon's mineral resources belong to the Government. Prospecting, exploration, and development activities for any mineral deposit are regulated by law and require a license or permit. Mining activities are governed by the provisions of the Mining Code (law No. 001 of April 16, 2001) as amended by Decree No. 2002/648/PM of March 26, 2002, and by law No. 2010/011 of July 29, 2010. Exploration and exploitation licenses were issued subject to the Government of Cameroon having a right to receive a 10% free-carried interest in the share capital of the project operating company. Decree No. 2011/3666/PM of November 2, 2011, created a system to account for diamond production and trade in accordance with the Kimberley Process Certification Scheme. In 2013, Cameroon achieved compliant country status with the Extractive Industries Transparency Initiative (Ministry of Finance, 2013).

Decree No. 2012/432 of October 1, 2012, reorganized the Ministère des Mines, de l'Industrie et du Développement Technologique (MINMIDT) [Ministry of Mines, Industries, and Technological Development]. The MINMIDT develops and implements industrial and mining policy. The MINMIDT's Brigade Nationale de Contrôle des Activités Minières [National Brigade for the Control of Mining Activities] is responsible for enforcing mining regulations and for monitoring logging activities, mineral exploration and mining activities, and the activities of spring and mineral water companies. The MINMIDT's Direction des Mines [Department of Mines] includes the Sous-direction des Activités Minières [Division of Mining Activities], the Sous-direction des Hydrocarbures [Division of Hydrocarbons], and the Sous-direction du Cadastre Minier [Division of Mining Registry]. The Direction de la Géologie [Department of Geology] included the Sous-direction de la Prospection Géologique [Division of Geological Prospection] and the Sous-direction de la Cartographie Géologique et des Risques Naturels [Division of Geologic Mapping and Natural Hazards]. The Direction de l'Industrie [Department of Industry] included the Sous-direction de la Transformation Locale [Division of Local Transformation], which is responsible for policies and programs for the local processing of mineral production. The Cadre d'Appui et de Promotion de l'Artisanat Minier (CAPAM) [Support Framework and Promotion of Artisanal Mining] is responsible for the support of artisanal miners and focusing on the transition of informal gold, rutile, sand and gravel, and sapphire mining operations to more formal ventures, such as mining cooperatives or more mechanized operations.

Production

In 2013, the main mineral commodities produced in Cameroon included aggregates, aluminum, cement, and crude petroleum. Production of aluminum metal increased by 44% compared with that of 2012. Clay output was estimated to have increased by 20%, and cement production was estimated to have decreased by 10%. Artisanal mine operations recovered small amounts of diamond and gold. Diamond recovery was estimated to have decreased by 46%. A variety of other industrial minerals were produced for domestic consumption (table 1).

Structure of the Mineral Industry

In 2013, Cameroon's gold and diamond mineral output was produced primarily by artisanal operations. The Government had issued a number of exploitation permits (mining licenses) to companies registered in Cameroon, which included Geovic Cameroon plc for cobalt-nickel, C & K Mining Co. for diamond and gold, Cam Iron SA for iron ore, Cimenteries du Cameroun for limestone, ETS Rocaglia for marble, Razel Fayat Cameroun for sand, and numerous other companies for aggregate and various types of stone.

Cameroon's mineral-processing facilities were mostly privately owned. Notable companies included Compagnie Camérounaise de l'Aluminium (Alucam), which produced aluminum, and Cimenteries du Cameroun, which produced cement. State-owned companies with mineral-related activities included Société National des Hydrocarbures (SNH), which was involved in hydrocarbon exploration and production in various joint ventures with multinational oil companies, and Société Nationale de Raffinage (SONARA), which refined crude petroleum. Table 2 is a list of the leading mineral industry facilities.

Commodity Review

Metals

Aluminum and Bauxite and Alumina.—Cameroon possessed significant reserves of bauxite, which is the basic raw material for the production of alumina and aluminum. At yearend, Aluvance plc of the United Kingdom formed a joint venture with Canyon Resources Ltd. of Australia through which Canyon could acquire up to 75% interest in the Birsok bauxite project. Canyon planned to continue exploration drilling on the Baoua, the Becka, the Djombi, the Fedal, and the Mbon prospects at Birsok (Aluvance plc, undated).

[1]Deceased.

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Cobalt and Nickel.—In 2013, Geovic Mining Corp. of the United States agreed to divest its 60.5% interest in Geovic Cameroon plc (GeoCam) to Jiangxi Rare Metals Tungsten Holdings Group Company Ltd. of China, subject to appropriate conditions and required approvals. The agreement also indicated Jiangxi's interest to acquire an offtake agreement to secure 100% of the output from the proposed Nkamouna cobalt and nickel project (Geovic Mining Corp., 2013).

Iron and Steel.—Construction continued on a steel plant at Ombe for Guff Steel Industries of Cameroon. The Guff Steel facility was to produce steel from remelted steel scrap. Also in 2013, POSCO of the Republic of Korea signed memoranda of understanding (MOUs) with the Government to develop a 500,000-metric-ton-per-year (t/yr)-capacity steel plant near Kribi and to assist the Government's Industrial Naval Shipyard of Cameroon with funding and technical training for the development of an offshore oil facility repair service. Société les Aciéries du Cameroun signed an MOU with the Government to build a steel minimill with a concrete reinforcing-bar plant. The facility would use iron ore from the Mbalam iron ore project to produce steel (Eneke, 2013; Nana, 2013).

Iron Ore.—In 2013, Afferro Mining Inc. of the United Kingdom continued exploration and drilling for iron ore in Cameroon and released a mineral resource estimate and a preliminary economic assessment for the Nkout project, which was located within the Djoum III license area, and a mineral resource estimate for the Ntem project. Afferro's other iron ore projects in Cameroon included the Akonolinga and the Essong exploration permits [SRK Consulting (UK) Ltd., 2013a, b].

In February, Jindal Steel and Power Ltd. of India discontinued discussions on the acquisition of equity interest in Afferro, citing low-grade magnetite reserves. Subsequent test work on the iron ore projects in Cameroon by Afferro, however, resulted in the production of an iron-ore concentrate with up to 68.5% iron content. In late February, Afferro signed an MOU with POSCO Africa (Proprietary) Ltd., which was a subsidiary of POSCO of the Republic of Korea, to enter negotiations concerning a significant investment in Afferro's Cameroon projects. The MOU subsequently lapsed, and in December, International Mining & Infrastructure Corporation plc of the United Kingdom acquired Afferro (Afferro Mining Inc., 2013a, b; Economic Times, 2013).

Aluvance plc of the United Kingdom continued preliminary exploration activity on the Bikoula iron ore project in south-central Cameroon. West African Mineral Corp. continued exploration on the Binga, the Lele, and the Djadom permits. Both companies were expected to release initial mineral resource estimates for their respective projects in 2014 (West African Minerals Corp., 2013; Aluvance plc, undated).

Sundance Resources Ltd. of Australia continued the development of the Mbalam-Nabeba iron ore project, which straddles the border of Cameroon and the Republic of the Congo [Congo (Brazzaville)]. Cam Iron SA, which was owned by Sundance (90%) and Hold Co. SA of Cameroon (10%), was responsible for the Mbalam operations in Cameroon. Contracts and financing for the Mbalam-Nabeba project were expected to be finalized by 2016, when construction of the mines could begin. Commercial ore production was expected to begin in 2019. The binational project included a proposed mining capacity of 35 million metric tons per year (Mt/yr) of direct-shipping ore (DSO) from the Mbalam iron ore deposit in Cameroon and the Nabeba iron ore deposit in Congo (Brazzaville). The hematite ore contained about 62.6% iron (Sundance Resources Ltd., 2014b, p. 5–6, 8, 16–18).

The project included the construction of a 510-kilometer (km) rail line from the Mbalam Mine in Cameroon to the coast and a 70-km rail spur to the Nabeba Mine in Congo (Brazzaville). It also included the construction of an iron ore export terminal at the to-be-developed deepwater terminal at Lolabe, which is located about 40 km south of Kribi, and was part of the new Kribi deepwater seaport complex that was under construction about 30 km south of Kribi (Sundance Resources Ltd., 2014a, p. 2–4).

Camina SA of Cameroon, in which Legend Mining Ltd. of Australia owned a 90% interest, held the Ngovayang iron ore prospect. The project, which was located about 90 km northeast of Kribiti, consisted of several prospects that had a magnetite ore with 20% to 40% iron content; DSO had not been discovered at Ngovayang. The MOU that covered the negotiation of an exploration joint venture on the Ngovayang project between Legend Mining and POSCO Africa expired in February 2013. In November, Legend Mining agreed to sell its interest in Camina to Jindal Steel and Power (Legend Mining Ltd., 2012, 2013; Business in Cameroon, 2014).

Industrial Minerals

Cement.—For the past few years, there has been a flurry of activity in the cement sector. In 2013, Afko Cement Production Company S.A., which was a subsidiary of AFKO Korea Inc. of the Republic of Korea, started construction of an 800,000-t/yr-capacity plant at Limbe in southwestern Cameroon. Ciments de l'Afrique was building a 500,000-t/yr-capacity plant at Bonaberi, which was north of Douala; initial production was expected in 2014. Sinoma International Engineering Co. of China was building a 1.2-Mt/yr-capacity plant at Douala for the Dangote Group of Nigeria; initial production was expected in 2014. The G Power Cement Group of Germany was building an 800,000-t/yr-capacity cement plant in Limbe, which was expected to start production by yearend 2015 (Musa and Felix, 2013; Chongwang, 2013a, b; Endong, 2013b).

Two additional cement projects in Cameroon had been proposed. In 2008, CATIR of China had proposed to build a 1- to 3-Mt/yr-capacity cement plant at Mintom. Cimenteries du Cameroun, which was Cameroon's only cement producer, operated two plants in 2013 and had initiated the construction of a third plant in 2011, but reported that there was no activity at the site (Djaligué, 2013; Endong, 2013a).

Diamond.—Diamond was recovered by artisanal miners throughout the country. Cameroon gained membership as a participant in the Kimberley Process Certification Scheme (KPCS) in 2012, which allowed diamond production from Cameroon to be sold in the international market where KPCS-certified diamonds are required by member countries.

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Outlook

The Government is expected to maintain its efforts to increase international interest in exploration for petroleum and nonfuel minerals. Ongoing investment in the southern rail line, the Kribi Port complex, and electrical power generation was expected to provide a basic level of infrastructure that could contribute to positive funding decisions for the development of the bauxite and iron ore projects, which were clustered in the southern part of the country. Excess capacity of the southern railroad and the new port facilities could be used to foster the development of mineral projects in northern Congo (Brazzaville).

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TABLE 1
CAMEROON: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2009	2010	2011	2012	2013
Aluminum metal, primary		73,000 r, 4	76,000 r, 4	69,000 4	52,000 r, 4	75,000 4
Cement, hydraulic		1,100,000	1,000,000	1,146,000 r, 4	1,275,000 r, 4	1,400,000
Clay		10,000	12,000	12,000	10,000	12,000
Diamond[5]	carats	8,000	6,000	6,000	5,000	2,723 4
Gold, mine output, Au content[5]	kilograms	1,800	1,600	1,600	1,500	1,600
Lime		1,000	1,000	1,157 4	1,251 4	1,200
Marble		100	100	105 4	145 4	150
Petroleum:						
Crude	thousand 42-gallon barrels	28,000	23,324 4	22,046 4	22,995 4	24,275 4
Refinery products	do.	12,000	10,000	10,000	10,000	10,000
Pozzolan, ash for cement		550,000	600,000	600,000	600,000	600,000

do. Ditto. r Revised.

[1]Estimated data are rounded to no more than three significant digits.

[2]Table includes data available through August 8, 2014.

[3]In addition to the commodities listed, a variety of industrial minerals and construction materials, such as aggregate, gypsum, sand and gravel, silica sand, and stone, may be produced, but available information is inadequate to make reliable estimates of output.

[4]Reported figure.

[5]From artisanal mining.

TABLE 2
CAMEROON: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum		Compagnie Camérounaise de l'Aluminium (Alucam) (Rio Tinto Alcan Group., 46.7%)	Plant at Edea	100
Cement		Cimenteries du Cameroun (Lafarge Group, 55%; Government, 43%; Cimenteries du Cameroun staff, 2%)	Plant at Bonaberi near Douala	1,600
Do.		do.	Grinding plant at Figuil	100
Diamond	carats	Artisanal	Various locations	12,000
Gold	kilograms	do.	do.	1,500
Limestone		Cimenteries du Cameroun (Lafarge Group, 55%; Government, 43%; Cimenteries du Cameroun staff, 2%)	Figuil	275
Petroleum:				
Crude	barrels per day	Various	Offshore and onshore	NA
Refined	do.	Société Nationale de Raffinage (SONARA) (Government, 100%)	Refinery at Limbe	45,000

Do., do. Ditto. NA Not available.

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The Mineral Industry of the Central African Republic

By Omayra Bermúdez-Lugo

In 2013, the Central African Republic was suspended from the Kimberley Process Certification Scheme and from the Extractive Industries Transparency Initiative and was not trading in rough diamond. These suspensions were the result of the continuation of civil unrest in the country. In December 2012, a coalition of rebel groups, known as Séléka, launched an attack against the Government, seizing several towns, including the strategic diamond mining town of Bria. Séléka overtook the capital city of Bangui on March 24, 2013, and overthrew the Government. On December 5, 2013, the United Nations Security Council raised concerns regarding the continuing deterioration of the security situation in the country and reported that it would consider imposing targeted measures against the Central African Republic, including measures against the illegal exploitation of diamond by armed groups. By yearend, the crisis was estimated to have caused the internal displacement of nearly 400,000 people (BBC News, 2013; Extractive Industries Transparency Initiative, 2013; Jackson, 2013; Kimberley Process Certification Scheme, 2013; United Nations Security Council, 2013; Kimberley Process Rough Diamond Statistics, 2014).

Diamond and gold were the only minerals for which production data had been reported in the Central African Republic before the onset of the crisis. All diamond and gold production in the country was mined by artisanal miners from alluvial deposits. For many years, information on clay, quartz, and sand and gravel, which were also produced in the country, has been inadequate to make reliable estimates of domestic output (table 1).

Prospects for growth in the Central African Republic's mineral sector had hinged on the development of the country's gold and uranium deposits, but the security situation in 2012–13, paired with a decrease in the price of uranium, hindered the progress of mining projects under development. AXMIN Inc. of Canada, which was in the process of securing financing for the development of the Passendro gold project, had to suspend operations in December 2012, after an armed group occupied the company's mining camp at Ndassima and seized food, medical supplies, and company vehicles. Following the incident, the company decided to temporarily suspend operations at the mining camp, although some staff were reported to have remained onsite. Since then, artisanal miners had been illegally mining for gold within the premises of the Ndassima camp, digging tunnels and pits throughout the concession area. AXMIN reported that the activities of these artisanal miners had created unstable surface areas throughout the concession. In late June 2013, more than 30 artisanal miners died at the camp after heavy rainfall triggered the collapse of one of these mining pits (AXMIN Inc., 2012, 2013a; Lewis, 2013).

In addition to the Passendro gold project, AXMIN also held interest in the Bambari 1 and 2 exploration concession areas. In late 2013, the Government granted the company a 1-year extension of the Bambari 1 and Bambari 2 exploration licenses and a 1-year extension of the Passendro gold project mining license. AXMIN would have until August 6, 2014, to meet all fiscal commitments for the Bambari 1 and Bambari 2 exploration concessions in order to continue its exploration operations and until January 10, 2015, to progress the Passendro project to the preproduction stage. The Bambari and Passendro projects are located about 400 kilometers east of Bangui (AXMIN Inc., 2013b). The successful development of these mining projects and the prospects for future foreign direct investment in mining will likely depend on the country's ability to restore political stability.

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TABLE 1
CENTRAL AFRICAN REPUBLIC: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		2009	2010	2011	2012	2013[e]
Diamond[3]	carats	311,779 [4]	301,557 [4]	323,575 [4]	365,917 [4]	-- [5]
Gold, mine output, Au content[6]	kilograms	61	59	53	55 [e]	60

[e]Estimated; estimated data are rounded to no more than three significant digits. -- Zero.
[1]Table includes data available through December 30, 2014.
[2]In addition to the commodities listed, Central African Republic produced clay, quartz crystal, and sand and gravel, but information is inadequate to make reliable estimates of output.
[3]Production is approximately 70% to 80% gem-quality diamond.
[4]Reported by the Kimberley Process Certification Scheme.
[5]The Central African Republic was under a temporary suspension from the Kimberley Process Certification Scheme and was not trading in rough diamond in 2013.
[6]Production from artisanal mining.

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The Mineral Industry of Chad

By Philip M. Mobbs[1]

Hydrocarbons were a leading segment of Chad's economy in 2013, accounting for about 90% of exports of goods, more than 70% of Government revenues, and about 30% of the nominal gross domestic product. This dependence made Chad's continuing economic growth prospects vulnerable to any decline in international oil prices (International Monetary Fund, 2014, p. 9).

Exploration and production of hydrocarbons were covered by the conventions governing research, exploration, production, and transportation of hydrocarbons dated December 19, 1988, and May 10, 2004, and amendments, including law No. 028/PR/00 of December 5, 2000. The Petroleum Revenue Management Law (law No. 001/PR/99 of 1999) and amendments, such as law No. 002/PR/06 of 2006, defined the allocation of petroleum revenues. Mining of minerals, which was a negligible contributing sector of the national economy, was regulated by the Mining Code (law No. 011/PR/95 of 1995). Law No. 014/PR/98 of 1998 covered the general principles for the protection of the environment.

Petroleum produced in the Doba basin was exported by way of the Chad-Cameroon export pipeline to an export terminal at Kribi, Cameroon. With the exception of crude oil produced from the oilfield on Permit H (Block H), which was moved by pipeline to the Djermaya refinery, new oilfield development projects were expected to export their production through the Chad-Cameroon pipeline. Most official nonfuel exports from landlocked Chad were trucked to seaports in Cameroon and Nigeria.

Production

The value and volume of production of crude oil far exceeded the output of the country's limited suite of other mineral commodities, which included aggregates, cement, clay, gold, lime, limestone, salt, sand, soda ash (natron), and stone. In 2013, the output of crude petroleum was estimated to have decreased by almost 13% compared with that of 2012. Estimates of Chad's mineral production are in table 1.

Structure of the Mineral Industry

The Ministère des Mines et de la Géologie and the Ministère du Pétrole et de l'Énergie monitored the activity of various sectors of the mineral industry. Société des Hydrocarbures du Tchad S.A. was the national oil company. Société Nationale de Cimenterie (SONACIM) was the national cement company, which also mined limestone. The private company Société Tchadienne d'Exploitation des Carrières (SOTEC) operated other large-scale industrial-mineral quarries in Chad. Small-scale domestic mining and quarrying operations produced the country's other nonfuel minerals. International companies were involved in the exploration for and production of crude oil.

[1]Deceased.

Commodity Review

Industrial Minerals

Cement.—Ciment du Tchad, which was a subsidiary of Government-owned SONACIM, operated the 200,000-metric-ton-per-year-capacity Baore cement plant, which produced cement from locally produced limestone and gypsum imported from Morocco. Domestic cement production was augmented by cement imported primarily from Cameroon and Nigeria (Xinhua News Agency, 2012; Société Nationale de Cimenterie, 2013).

Mineral Fuels

Petroleum.—Exxon Mobil Corp. of the United States reported that Esso Exploration and Production Chad, Inc. (Esso Chad) produced an average of 73,000 barrels per day (bbl/d) of crude oil in 2013 compared with an average of 90,000 bbl/d in 2012. To offset the decreased production that was attributed to natural reservoir decline and the increased water content of the fluids produced, Esso Chad continued to drill additional development wells in the Bolobo, the Kome, and the Miandoum fields (Exxon Mobil Corp., 2014, p. 36).

CNPC International (Chad) Ltd., which was a subsidiary of China National Petroleum Corp., operated the Koudalwa and the Ronier oilfields on Block H. The petroleum refinery at Djermaya was operated by a joint venture of CNPC International and Société des Hydrocarbures du Tchad S.A. In August, the Government suspended CNPC International's crude oil exploration and production activities owing to environmental issues. Exploration and production operations resumed in October (Nako, 2014).

In January, the new management of Griffiths Energy International Inc. of Canada settled legal proceedings that had been brought against the company under the Corruption of Foreign Officials Act and subsequently took the company public. In May, the company changed its name to Caracal Energy Inc. In June, GlencoreXstrata plc of Switzerland acquired 35% working interest in the Badila and the Mangara development operations from Caracal and Société des Hydrocarbures du Tchad (Griffiths Energy International Inc., 2013; Oil & Gas Journal, 2013; Tait, 2013).

PetroChad (Mangara) Ltd., which was a subsidiary of Caracal, started production from the Badila field in September. About 529,150 barrels of crude oil was produced by yearend; initial production was used to charge the 16-kilometer (km), 30.48 centimeter (cm)-diameter pipeline spur that connected the Badila field to the Chad-Cameroon export pipeline. The spur line was expected to be filled in early 2014, after which oil could be exported (Caracal Energy Inc., 2014a).

PetroChad expected to bring the Mangara field on the DOB Block onstream in 2014. The Mangara field would be

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connected to the Badila field crude-oil-processing facilities by a 97-km, 30.48-cm-diameter oil pipeline and an adjacent 15.24-cm-diameter natural gas pipeline. The gas was to be used as fuel to provide electrical power for the processing terminal at Badila. Production from the two fields was projected to reach about 45,000 barrels per day (bbl/d) by the end of 2014, which was a significant increase from about 11,000 bbl/d that the Badila field was producing at yearend 2013 (Caracal Energy Inc., 2014b).

Other exploration activity in Chad included that of ERHC Energy Inc. of the United States, which continued preliminary work on the BDS–2008 Block. In 2013, EHRC relinquished its portion of the Chari Ouest Block III and the Manga Blocks. Overseas Petroleum and Investment Corp., which was a subsidiary of CPC Corp., Taiwan, continued to drill and test its exploration acreage on its portion of the Chari Ouest Block III. Activity in 2013 by Simba Energy Inc. of Canada was directed at retaining the production-sharing contracts that covered the Chari Sud I Block, the southern one-half of the Chari Sud II Block, and the Erdis III Block. United Hydrocarbon Chad Ltd., which was a subsidiary of United Hydrocarbons International Corp. of Canada, expected to begin a drill program on the DOC and the DOD Blocks in 2014. Oil had been discovered on the DOC Block in 1978 and on the DOD Block in 1994 (ERHC Energy Inc., 2013, p. 7).

Outlook

In the past few years, the Government has resumed its encouragement of mineral exploration, especially for metals, and it has issued several permits for gold and uranium exploration, primarily in southwestern Chad. In the short term, production from new oilfields is expected to offset partially the notable decline in production from the more mature fields in the Doba basin. Petroleum exploration is expected to continue in southern Chad, which, if successful, could lead to the development of additional crude oil and natural gas deposits.

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TABLE 1
CHAD: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1,2]

(Metric tons unless otherwise specified)

Commodity[3]		2009	2010	2011	2012	2013
Cement		--	--	10,000	200,000	200,000
Petroleum:						
Crude[4]	thousand 42-gallon barrels	43,600	44,700 r	43,600 r	41,200 r	36,000
Refined	do.	--	--	1,000	4,000	4,000
Soda ash, natron		12	12	13	13	13

rRevised. do. Ditto. -- Zero.

[1]Estimated data are rounded to no more than three significant digits.

[2]Table includes data available through May 8, 2014.

[3]In addition to the commodities listed, other minerals and construction materials, such as aggregate, clay, gold, lime, limestone, salt, sand, and stone are produced, but information is inadequate to make reliable estimates of output.

[4]Includes reported crude shipments from the Doba Basin in Chad, which was metered on a floating storage-and-offloading vessel that was located offshore Kribi, Cameroon.

TABLE 2
CHAD: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and and major equity owners	Location of main facilities	Annual capacity
Cement		Ciment du Tchad [Société Nationale de Cimenterie (SONACIM)]	Baore plant, Bisi Keda, Mayo-Kebbi Ouest Department	200,000
Gold	kilograms	Artisanal placer operations	Mayo Dala Department	150 e
Petroleum:				
Crude	million 42-gallon barrels	Esso Exploration and Production Chad, Inc. (Esso Chad) (Exxon Mobil Corp., 40%; Petronas Carigali Overseas Sdh. Bhd., 35%; Chevron Overseas Petroleum Inc., 25%)	Bolobo, Kome, Maikeri, Miandoum, Moundouli, and Nya, and Timbre fields, Doba Basin	79 e
Do.	do.	CNPC International (Chad) Ltd. (a subsidiary of China National Petroleum Corp.)	Permit H, which includes the Koudalwa and the Ronier fields	22 e
Do.	do.	PetroChad Ltd. (Caracal Energy Ltd., 50%; GlencoreXstrata plc, 35%, Société des Hydrocarbures du Tchad S.A., 15%)	Badila field	4 e
Refined products	do.	CNPC International (Chad) Ltd. (a subsidiary of China National Petroleum Corp., 60%, and Société des Hydrocarbures du Tchad S.A., 40%)	Djermaya refinery, about 30 kilometers north of N'Djamena	7
Salt		Various local operators	Various locations	10,000 e
Soda ash		do.	Lake Chad, near Liwa	13,000 e

eEstimated. Do., do. Ditto.

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The Mineral Industries of Comoros, Mauritius, Reunion, and Seychelles

By Philip M. Mobbs[1]

COMOROS

Comoros consists of an archipelago of islands that is located between Madagascar and Mozambique. The real gross domestic product (GDP) of Comoros was estimated to have increased by 3.5% in 2013. Mineral commodity output in Comoros may have included small quantities of common building materials for domestic consumption. In 2013, cement was imported primarily from India and Pakistan, petroleum products from Madagascar, and steel bars from Turkey (International Monetary Fund, 2014; United Nations Statistics Division, 2014).

In 2013, a new petroleum code was promulgated, and the Government awarded its first petroleum production-sharing contracts to the joint venture of Discover Exploration Comoros B.V. (60% working interest), which was a subsidiary of Discover Exploration Ltd. of the United Kingdom, and Bahari Resources Ltd. of Kenya (40% working interest). The joint venture subsequently acquired seismic data that encompassed its three deepwater exploration blocks (A, B, and C) (Discover Exploration Ltd., 2013, p. 10).

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MAURITIUS

The Republic of Mauritius consists of several islands and islets that are located about 900 kilometers (km) east of central Madagascar. Real GDP was estimated to have increased by 3.2% in 2013. Construction accounted for an estimated 5.5% of the GDP, whereas mining and quarrying, which contributed about 0.3% to the GDP in 2013, was a minor factor in the economy. Mineral-related output included crushed basalt, coral sand, and solar-evaporated marine salt, and the production of lime for the domestic agriculture market and steel concrete-reinforcing bar for the construction market. Petroleum products were imported to fuel electricity-generating power stations and for transportation fuel (Statistics Mauritius, 2014, p. 10, 14).

Data on mineral production are in table 1, and information on the structure of the mineral industry is in table 2.

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REUNION

Reunion is a volcanic island located about 200 km southwest of Mauritius. Administratively, it is an overseas department of France. Mineral production represented only a very small part of the economy of Reunion; quantitative information on mineral production was not available. Aggregates and coral sand were produced on the island, primarily for local consumption needs, and cement was processed from imported clinker. All demand for metals and mineral fuels was met through imports.

SEYCHELLES

The Seychelles Archipelago is located in the Indian Ocean about 1,000 km northeast of Madagascar. The mineral industry is administered by the Ministry of Defense, Legal Affairs, Information, Youth, and Hydrocarbons and the Ministry of Natural Resources and Industry. The Mineral Act of 1962 governs mineral extraction and mining; the Removal of Sand and Gravel Act of 1982 regulates the mining of beach sand; and the Petroleum Mining Act of 1976 governs hydrocarbon exploration and production. Activity in the hydrocarbon sector is also regulated by the Seychelles Petroleum (Taxation) Act of 2008 and the Seychelles Petroleum (Taxation) (Amendment) Act of 2013. The petroleum potential of the Seychelles offshore region was promoted by the Government's PetroSeychelles Ltd.

Aggregates, clay for bricks, granite dimension stone, and salt were produced in the Seychelles. In 2013, the production of crushed granite decreased by about 13% compared with that of 2012. Small quantities of guano, which was an organic phosphate fertilizer, were mined intermittently. Data on mineral production are in table 1.

In 2013, the joint venture of East African Exploration (Seychelles) Ltd. (75% working interest), which was a subsidiary of Afren plc of the United Kingdom, and Avana Petroleum Ltd. (25% working interest), which was a subsidiary of Vanoil Energy Ltd. of Canada, had a three-dimensional seismic survey shot across its offshore petroleum exploration license areas. The Government signed an agreement with Japan Oil, Gas and Metals National Corp. to conduct additional geochemical, geologic, and geophysical surveys offshore

[1]Deceased.

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Seychelles. Also in 2013, WHL Energy Ltd. of Australia continued to negotiate with other international petroleum exploration companies and the Government regarding the assigning of its Seychelles petroleum exploration license to another party (Japan Oil, Gas and Metals National Corp., 2013; WHL Energy Ltd., 2013, p. 1; Afren plc, 2014, p. 58).

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TABLE 1
MAURITIUS AND SEYCHELLES: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons)

Country and commodity[2]	2009	2010	2011[e]	2012[e]	2013[e]
MAURITIUS					
Aggregates, includes crushed basalt[e]	600,000	500,000	500,000	550,000	500,000
Fertilizers	31,014	24,326	27,000	27,000 [r]	27,000
Salt, marine	2,301	1,349	3,500	3,800	3,800
Sand	87,506	68,708	44,035 [3]	40,000	40,000
Steel, rebar[e]	31,000 [3]	32,000 [3]	34,000	32,000	32,000
SEYCHELLES					
Aggregates					
Granite, crushed (locally known as crusher dust)	160,000	180,520	120,214 [r,3]	155,946 [3]	136,000 [3]
Other than crushed granite	150,000	156,710	101,046 [r,3]	123,759 [3]	117,471 [3]

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised.
[1]Table includes data available through December 2, 2014.
[2]In addition to the commodities listed, lime also was produced in Mauritius; aggregates, cement, and sand were produced in Reunion; and clay for bricks, granite dimension stone, and salt were produced in Seychelles, but information is inadequate to make reliable estimates of output.
[3]Reported figure.

TABLE 2
MAURITIUS, REUNION, AND SEYCHELLES: STRUCTURE OF THE MINERAL INDUSTRIES IN 2013

(Metric tons)

Country and commodity	Major operating companies	Location of main facilities	Annual capacity[e]
MAURITIUS			
Aggregates	Betonix Ltd. (Bhunjun Group)	Nouvelle France and Tour Koenig	NA
Do.	Gamma Civic Ltd.	Solitude	NA
Do.	United Basalt Products Ltd.	Near Ausailles	660,000
Fertilizers	Mauritius Chemical and Fertilizer Industry Ltd. (Harel Mallac Group)	Port Louis	100,000
Salt	Mont Calme Ltd.	Evaporation ponds at Tamarin	NA
Steel, rebar	Samlo Koyenco Steel Company Ltd.	Near Midlands	12,000
REUNION			
Cement	Holcim (Outre-Mer) S.A.S. (Holcim Ltd.)	Ibity grinding plant, Le Port	600,000
SEYCHELLES			
Granite	Gondwana Granite Ltd.	Victoria, Mahe Island	NA
Stone, crushed	United Concrete Products (Seychelles) Ltd.	Pointe La Rue, Mahe Island	150,000
Do.	Civil Construction Company Ltd.	Cap Samy, Praslin Island	97,000

[e]Estimated. Do. Ditto. NA Not available.

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The Mineral Industry of Congo (Brazzaville)

By Philip M. Mobbs[1]

The economy of the Republic of the Congo, also known as Congo (Brazzaville), was based primarily on the production of crude oil, which in 2013 was estimated to account for about 58% of the nominal gross domestic product. In 2012 (the latest year for which appropriate data were available), the oil industry accounted for about 74% of Government revenue, and mining, about 0.04%. International interest in the development of the nonfuel mineral resources of Congo (Brazzaville) has increased in recent years, and much of the focus of multinational mining companies was on the country's gold, iron ore, limestone, and potash resources (Extractive Industries Transparency Initiative, 2013, p. 9; International Monetary Fund, 2014, p. 20).

Production

Most of the country's hydrocarbons were produced from offshore fields, but much of the natural gas produced was flared because of the lack of gas-gathering infrastructure. According to BP p.l.c., Congo (Brazzaville) ranked seventh in terms of the volume of crude oil production among African crude oil producers in 2013. Estimates of crude oil production in Congo (Brazzaville) for 2013 by BP were higher than data reported by the Ministère des Hydrocarbures.

Cement production was estimated to have increased in 2013 with the startup of the Forspak International Congo S.A.R.L. plant at Dolisie. Diamond production statistics obtained from the Kimberley Process Certification Scheme (KPCS) indicated that output increased by about 10% in 2013 compared with that of 2012 (table 1; Bouiti-Viaudo, 2014; BP p.l.c., 2014, p. 10; Kimberley Process Certification Scheme, 2014).

Structure of the Mineral Industry

The mineral sector is under the jurisdiction of the Ministère des Mines et de la Géologie. Mining is regulated by the Code Minier (law No. 4–2005), which requires that a Congolese company operate exploitation licenses. Article 100 of the code entitles the Government to a free (carried) equity interest of not less than 10% in mining operations. Decree No. 2007–274 sets the conditions for prospecting, exploration, and exploitation of minerals, and Decree No. 2007–293 addresses quarrying issues. The Ministère du Tourisme et de l'Environnement reviews environmental assessments of mineral development projects. Congo (Brazzaville) was a participant in the KPCS and became a compliant country of the Extractive Industries Transparency Initiative in 2013 (Extractive Industries Transparency Initiative, 2013, p. 2).

Artisanal miners dominated the diamond and gold mining sectors. Small-scale domestic operations quarried construction materials, such as gravel, sand, and stone, although multinational cement companies had started to develop the country's limestone resources and international construction companies had obtained a number of quarrying permits for sand and stone to support infrastructure construction projects. About 70 mining companies were exploring or prospecting for nonfuel minerals in Congo (Brazzaville). Much of the international mining companies' exploration activity was for gold, iron ore, and potash. A few mineral projects were at an advanced stage of development.

The Ministère des Hydrocarbures oversees activity in the hydrocarbon sector. The sector is regulated by the Code des Hydrocarbures (law No. 24–1994). Procedures for awarding oil and gas exploitation licenses are set out in Decree No. 2008–15. State-owned Société Nationale des Pétroles du Congo (SNPC) manages the Government's interest in petroleum production and refining and natural gas production and processing. International oil companies operate many of the oilfields (table 2).

Commodity Review

Metals

Iron Ore.—Iron ore exploration took place primarily in the Invindo Massif area, which is located in the Cuvette-Ouest and the Sangha Departments in northwestern Congo (Brazzaville), and in the Massif du Chaillu area, which is located in the Lekoumou and the Niari Departments in southwestern Congo (Brazzaville).

In 2013, Core Mining Congo S.A.R.L., which was a subsidiary of Core Mining Ltd. of the United Kingdom, received a mining permit for the Avima project in the Sangha Department. Core Mining planned to begin iron ore production by 2015 at a rate of about 3 million metric tons per year (Mt/yr) of direct-shipping ore, which was expected to have a grade of more than 59% iron. The ore would be trucked to the Ogooue River at Booue, Gabon, and then barged to Port Gentil, Gabon, for shipment overseas (Core Mining Ltd., 2013, undated).

In 2013, Exxaro Resources Ltd. of South Africa acquired 100% of the issued shares of DMC Iron Congo S.A.R.L., which was developing the Mayoko-Lekoumou project. In mid-2013, the project, which is located in the Niari Department and included the Lekoumou, the Mayoko, and the Ngoubou-Ngoubou iron ore prospects, was placed on hold pending the finalization of the mining convention and the shipping agreements with the Port of Pointe Noire and the Chemin de Fer Congo-Océan railway system. The mining convention was expected to specify the royalty rate to be imposed on the mineral production, any foreign exchange controls that would apply to the proceeds of the sale of mineral production, other fiscal rights and responsibilities, taxation terms, and the stipulations for the company's access to infrastructure (Equatorial Resources Ltd., 2014b; Exxaro Resources Ltd., 2014).

In 2012, Equatorial Resources Ltd. of Australia completed an environmental and social impact assessment, and in 2013, a mineral resource estimate and a scoping study on the Mayoko-

[1]Deceased.

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Moussondji project in southwestern Congo (Brazzaville). Total indicated and inferred resources were 917 million metric tons (Mt) at a grade of 31.4% iron. Congo Mining Ltd., which was Equatorial Resources' domestic subsidiary, submitted a development plan to the Government for the Mayoko-Moussondji project. Congo Mining also signed convention agreements for the Moussondji-Fer Est and the Moussondji-Fer Ouest licenses and completed a drilling program on the Balondo prospect in Sangha Department (Equatorial Resources Ltd., 2014a, p. 1–9).

Mining Projects Development Congo S.A. (MPD Congo), which was a subsidiary of the joint venture of Glencore Xstrata plc of Switzerland and Zanaga Iron Ore Company Ltd. of the United Kingdom, continued work on the Zanaga iron ore project, which is located about 300 kilometers (km) northeast of Pointe Noire in Lekoumou Department. MPD Congo expected to complete a bankable feasibility study for the project in 2014 (Zanaga Iron Ore Company Ltd., 2014, p. 1).

Sundance Resources Ltd. of Australia significantly advanced the Mbalam-Nabeba iron ore project, which consisted of the Mbalam prospect in Cameroon and the Nabeba prospect in Sangha Department, Congo (Brazzaville). In 2013, a mining permit was issued for the Nabeba prospect. Sundance continued discussions with contractors concerning construction and financing proposals for port and rail infrastructure, evaluated a number of proposals for the funding and construction of an ore-processing plant, and continued negotiations for the sale of equity in the mine or the project and for iron ore take-or-pay contracts. The project was expected to have an iron-ore-production capacity of 35 Mt/yr (Sundance Resources Ltd., 2014, p. 1–5).

Equamineral S.A., which was a subsidiary of Equamineral Holdings Ltd. of Australia, continued exploration of the Oyabi permit in Cuvette-Ouest Department. Waratah Resources Ltd. of Australia announced its intent to divest its Congolese iron ore assets, which included the Okanabora exploration license in Cuvette-Ouest Department (Waratah Resources Ltd., 2014).

Industrial Minerals

Cement.—In 2013, Société Nouvelle des Ciments du Congo (SONOCC) continued work on the expansion of the Loutete plant to 300,000 metric tons per year (t/yr) capacity from about 210,000 t/yr. In November, Forspak International Congo S.A.R.L. started production from its 300,000-t/yr-capacity cement plant at Dolisie (Service Économique de Brazzaville, 2012a, b; Kitina, 2014).

In 2014, Dangote Group of Nigeria expected to complete the construction of a planned 1.5-Mt/yr-capacity cement plant at Madingou, which is located about 190 km east of Brazzaville. Diamond Cement Congo S.A., which is a subsidiary of West African Cement S.A. of Ghana, was building a 600,000-t/yr-capacity cement plant at Mindouli, which is located about 100 km east of Brazzaville. Initial production was scheduled to begin in early 2015. Also in 2015, initial production was expected to begin from a planned 500,000-t/yr-capacity cement plant that Ciments de l'Afrique of Morocco proposed to build at Makola, which is located about 5 km northeast of Hinda (Africa Impact Group, 2014; Mvouanzi, 2014; Oye, 2014).

Phosphate Rock.—Cominco Resources S.A., which was a subsidiary of Cominco Resources Ltd. of the United Kingdom, continued work on the development of a mine near Hinda, which is located about 37 km northeast of Pointe Noire. A 2013 prefeasibility study estimated that the Hinda project's ore reserves were 433 Mt at a grade of 10.5% phosphorus pentoxide (P_2O_5). The study also projected a 26-year mine life, with the phosphate rock output of 4 Mt/yr upgraded to 32% P_2O_5. Cominco expected to complete a definitive feasibility study of the Hinda project in 2014. Initial production could begin as soon as 2016 with a positive investment decision (Cominco Resources Ltd., 2014, p. 18, 37).

Potash.—In 2013, MagIndustries Corp. of Canada secured financing for the development of the Mengo potash project and signed a number of construction and engineering contracts. MagIndustries started clearing and leveling the plant site for a proposed 1.2-Mt/yr-capacity processing facility. Initial production could begin as soon as 2016, subject to the availability of financing (MagIndustries Corp., 2014a, p. 2; 2014b, p. 1–5).

In 2013, Sintoukola Potash S.A., in which Elemental Minerals Ltd. of Australia held a 93% equity interest, was awarded a mining license for the Sintoukola potash project, which is located about 55 km northwest of Pointe Noire. The project's environmental and social impact assessment was approved by the Ministère du Tourisme et de l'Environnement. At midyear 2013, Elemental Minerals suspended work on the project's bankable feasibility study to concentrate on negotiations with Dingyi Group Investment Ltd. of Bermuda, which had proposed in April to acquire Elemental Minerals (Elemental Minerals Ltd., 2013a, b; 2014).

In February, African Potash Ltd. of Guernsey [United Kingdom] acquired 70% indirect interest in Société des Potasses et des Mines S.A., which held the Lake Dinga potash exploration permit. African Potash planned to start an exploration program at Lake Dinga in 2014. Holle Potash Corp. of Canada, through its subsidiaries Holle Potash African Holding Ltd. and Holle Potash (Republic of Congo) Ltd. of the United Kingdom, held 100% interest in Afrimines S.A. of Congo (Brazzaville). Afrimines expected to begin a drilling program on the Tchitondi potash and salt exploration permits in 2014 (African Potash Ltd., undated).

Outlook

Despite the continued decrease in production from the older oilfields, the petroleum sector is expected to remain the cornerstone of Congo (Brazzaville)'s economy for the short-term future, in part because of new deepwater oilfields coming onstream. Crude oil output is expected to peak again in 2017, after which time oil production is projected to resume an annual decrease in the 2%- to 10%-per-year range. Multinational cement companies have begun to develop the country's limestone resources to produce cement. Congo (Brazzaville)'s cement production capacity is expected to be significantly increased in the next 3 to 4 years, and the country is likely to become a cement exporter. Development of iron ore deposits and the redevelopment of coastal potash deposits are expected

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to lead to further diversification of the national economy and to begin to ease the country from its dependence on petroleum. The decrease in iron ore and potash prices in 2013, however, is expected to slow the progress of the iron ore and potash projects (Bousso, 2013; Stringer, 2014).

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TABLE 1

CONGO (BRAZZAVILLE): ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1,2]

Commodity[3]		2009	2010	2011	2012	2013
Cement	metric tons	110,000	80,000	70,000	150,000	170,000
Diamond[4]	carats	68,000	381,242	76,548	51,588	56,495
Gold, mine output, Au content	kilograms	100	150	150	150	150
Liquid petroleum gas[5]	thousand 42-gallon barrels	2,469 [4]	1,300	1,400	1,400	1,300
Petroleum:						
Crude[4]	do.	99,348	107,000	108,000	99,000	88,338
Refined	do.	3,000	4,000 r	3,000 r	2,500 r	2,500

do. Ditto. rRevised.

[1]Estimated data are rounded to no more than three significant digits.

[2]Table includes data available through October 9, 2014.

[3]In addition to the commodities listed, copper ore, crude construction materials (for example, clay, sand and gravel, and stone), lead ore, lime, limestone for cement, and zinc ore were produced, but available information is inadequate to make reliable estimates of output. Natural gas was also produced, but output was flared, reinjected, or vented.

[4]Reported figure.

[5]Includes butane and propane.

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TABLE 2
CONGO (BRAZZAVILLE): STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand 42-gallon barrels unless otherwise specified)

Commodity		Major operating companies and and major equity owners	Location of main facilities	Annual capacity[e]
Cement	metric tons	FORSPAK International Congo S.A.R.L.	Dolisie	300,000
Do.	do.	Société Nouvelle des Ciments du Congo (SONOCC) (Société National Chinoisedes Travaux des Ponts et Chaussées, 56%, and Government, 44%)	Loutete	210,000
Copper	do.	Société de Recherche et d'Exploitation Minière S.A. (SOREMI) (Gerald Metals, Inc., 90%, and Government, 10%)	Grande Mines, Boko Songo	NA
Diamond	carats	Artisanal production	Kouilou, Lekoumou, Likouala, Niari, and West Cuvette Departments	400,000
Gold	kilograms	do.	Various locations	150
Liquefied petroleum gas		Total Exploration & Production Congo, 53.5%; Chevron Overseas (Congo) Ltd., 31.5%; Société Nationale des Pétroles du Congo (SNPC), 15%	Nkossa platform, offshore	3,000
Petroleum:				
Crude		Eni Congo S.A., 90%	Awa/Paloukou field, offshore	4,000
Do.		Murphy Oil Corp., 50%; PA Resources AB, 35%; Société Nationale des Pétroles du Congo (SNPC), 15%	Azurite field, offshore	(1)
Do.		Eni Congo S.A., 65%, and Société Nationale des Pétroles du Congo (SNPC), 49%	Djambala, Foukanda, and Mwafi fields, offshore	7,300
Do.		Congorep [Perenco Group, 51%, and Société Nationale des Pétroles du Congo (SNPC), 49%]	Emeraude field, offshore	8,000
Do.		Eni Congo S.A., 100%	Ikalou and Ikalou Sud fields, offshore	3,000
Do.		Eni Congo S.A., 65%, and Société Nationale des Pétroles du Congo (SNPC), 35%	Kitina field, offshore	15,000
Do.		Total Exploration & Production Congo, 65%, and Eni Congo S.A., 35%	Kombi, Libondo, Likalala Tchibeli, and Tchibouela fields, offshore	25,000
Do.		Eni Congo S.A., 75%	Kouakouala field, onshore	NA
Do.		Congorep [Perenco Group, 51%, and Société Nationale des Pétroles du Congo (SNPC), 49%], 65%, and Eni Congo S.A., 35%	Likouala field, offshore	5,000
Do.		Eni Congo S.A., 50%, and Total Exploration & Production Congo, 50%	Loango field, offshore	6,500
Do.		Eni Congo S.A., 85%	Loufika and Zingali fields, onshore	NA
Do.		Eni Congo S.A., 83%, and Tullow Oil plc, 11%	M'Boundi field, onshore	20,000
Do.		Total Exploration & Production Congo, 53.5%; Chevron Overseas (Congo) Ltd., 31.5%; Société Nationale des Pétroles du Congo (SNPC), 15%	Moho-Bilondo field, offshore	32,000
Do.		do.	Nkossa and Nsoko fields, offshore	18,000
Do.		Total Exploration & Production Congo, 55.25%; Eni Congo S.A., 29.75%; Société Nationale des Pétroles du Congo (SNPC), 15%	Sendji and Yanga fields, offshore	9,500
Do.		Total Exploration & Production Congo, 65%, and Eni Congo S.A., 35%	Tchendo field, offshore	3,000
Do.		CMS NOMECO Congo [Société Nationale de Recherche et d'Exploration Pétrolière, 50%; Perenco Group, 25%; Nuevo Congo Co., 18.75%; Kuwait Foreign Petroleum Exploration Co. (K.S.C.), 6.25%]	Yombo field, offshore	3,600
Do.		Eni Congo S.A., 65%, and Total Exploration & Production Congo, 35%	Zatchi field, offshore	7,600
Refined products		Congolaise de Raffinage (CORAF) [Société Nationale des Pétroles du Congo (SNPC), 100%]	Pointe Noire	7,600

[e]Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.
[1]Production ceased in 2013. Field abandonment underway.

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The Mineral Industry of Congo (Kinshasa)

By Thomas R. Yager

The Democratic Republic of the Congo [Congo (Kinshasa)] played a globally significant role in the world's production of cobalt, copper, diamond, tantalum, and tin. In 2013, the country's share of the world's mined cobalt production amounted to 48%; tantalum, 17%; diamond, 12%; copper, 5%; refined cobalt, nearly 4%; and tin, 1%. Congo (Kinshasa) accounted for about 47% of the world's cobalt reserves. Crude petroleum production also played a significant role in the domestic economy. The country was not a globally significant consumer of minerals or mineral fuels (Cobalt Development Institute, 2014; Janse, 2014; Anderson, 2015; Brininstool, 2015; Papp, 2015; Shedd, 2015).

Minerals in the National Economy

The mining and mineral processing sector accounted for an estimated 20.9% of the gross domestic product (GDP) in 2013, and the manufacturing sector, 22%. The copper mining subsector accounted for 13.5% of GDP; the cobalt mining subsector, 5%; the petroleum extraction subsector, 3.1%; the quarrying subsector, 2.9%; the diamond mining subsector, 0.8%; and other minerals, 0.7% (Banque Centrale du Congo, undated, p. 45).

Between 1.8 and 2 million artisanal miners were estimated to be employed in Congo (Kinshasa) in 2012 (the latest year for which data were available), which included between 800,000 and 1 million miners in diamond mining and between 100,000 and 130,000 miners in gold mining in the Ituri Interim Administration of Orientale Province. In 2013, a partial survey of mines in Katanga, Maniema, Nord-Kivu, and Sud-Kivu Provinces found that about 35,000 miners were employed in niobium, tantalum, tin, and tungsten mining. Additional surveys were planned for 2014 (United Nations Environmental Programme, 2011, p. 32; Diamond Development Initiative, 2012; van Puijenbroek and others, 2012, p. 12–13; Spittaels and Hilgert, 2013).

Government Policies and Programs

In 2002, the Parliament of Congo (Kinshasa) passed law No. 007/2012 of July 11, 2002, which replaced law No. 81–013 of April 2, 1981. The revised mining code encourages private sector development of the mineral industry; the principal role of the Government is to encourage and regulate the development of the industry. Mining rights are vested with the Government. In 2013, the Government was considering a new mining code that would increase its free-carried and non-dilutable share in mining projects to 35% from 5%. The proposed mining code would increase royalty rates on precious metals to 6% from 2.5%, and on nonferrous metals, to 6% from 2%. Exploration permits would be reduced to 6 years from 15 years. The proposed mining code would not be submitted for approval by the Congolese Parliament before the first quarter of 2014 (Engineering & Mining Journal, 2014a).

In April 2013, the Government issued a decree that banned the export of cobalt and copper concentrates. Companies were given a 90-day moratorium to comply with the ban; the moratorium subsequently was extended until yearend. The extension of the moratorium could be attributable to insufficient capacity to process cobalt and copper concentrates (Engineering & Mining Journal, 2014a).

In July 2010, the U.S. Congress passed the Dodd-Frank Wall Street Reform and Consumer Protection Act, which contains provisions concerning the use of minerals to finance armed groups in eastern Congo (Kinshasa). The U.S. Securities and Exchange Commission (SEC) issued regulations in final form in accordance with the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act) in August 2012 (U.S. Securities and Exchange Commission, 2012, p. 56274–56275).

Under the regulations, all companies registered with the SEC that sold products containing gold, tantalum, tin, or tungsten were required to disclose whether these minerals originated from Congo (Kinshasa) or adjoining countries. Companies that sold products containing gold, tantalum, tin, or tungsten that originated in Congo (Kinshasa) or adjoining countries were also required to submit annual reports to the SEC describing the due diligence measures taken to determine the source and custody of such minerals and to provide a description of the products manufactured or contracted to be manufactured that are not conflict-free (U.S. Securities and Exchange Commission, 2012, p. 56274).

In March 2011, the Government of Katanga Province and the International Tin Research Institute (ITRI) started the ITRI Tin Suppy Chain Initiative (iTSCi), which is a traceability mechanism for domestically produced tantalum, tin, and tungsten to meet end users' requirements under the Dodd-Frank Act and Organisation for Economic Co-operation and Development due diligence guidelines. By the end of 2012, 140 mine sites were covered by the scheme in Katanga Province. ITRI restarted certification in Sud-Kivu Province in October 2012 after 2 years of suspension and initiated certification in Maniema Province in December 2012 (International Tin Research Institute, 2013).

By the end of 2013, the iTSCi program had been implemented in 27 subsectors in the Kailo Territory and the Pangi Territory in Maniema Province. The mine sites covered by the iTSCi program in Pangi Territory were located near Kalima. In December, a feasibility study on expanding the program to Punia Territory in Maniema Province was completed with favorable results. The program was expected to commence in Punia Territory in January 2014 (International Tin Research Institute, 2014b).

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Production

In 2013, the production of silver increased by 390%; mined copper, by an estimated 47%; refined copper, by 45%; sulfuric acid, by an estimated 44%; gold, by an estimated 21%; germanium, by an estimated 20%; zinc, by 19%; and mined cobalt, by an estimated 12%. Tin and tungsten production decreased by an estimated 23% each; tantalum, by an estimated 20%; diamond, by 18%; and niobium, by an estimated 17% (table 1).

Structure of the Mineral Industry

La Générale des Carrières et des Mines (Gécamines), which was a state-owned company, produced cobalt and copper. Other cobalt and copper mining companies were privately owned; Gécamines held shares of between 5% and 40% in numerous operations. Private companies held majority shares in the cement producers; Gécamines held a 49.73% share in Ciment et Matériaux du Katanga. The Government held an 80% share in the large-scale diamond producer Société Minière de Bakwanga (MIBA). Artisanal and small-scale miners accounted for most Congolese output of diamond, gold, niobium, tantalum, tin, and tungsten. Artisanal and small-scale miners also played a significant role in the country's cobalt mine production.

Mineral Trade

Total reported exports were valued at $10.9 billion in 2013, and imports, $10 billion. Copper accounted for 68% of the total value of Congolese exports; cobalt, 17%; crude petroleum, 8%; diamond, 2%; and gold, 1%. Other mineral exports included germanium, niobium, tantalum, tin, tourmaline, and tungsten. Mineral fuels accounted for about 10% of total imports in 2013. In 2013, the share of Congolese copper and cobalt production that was refined prior to export was 71% and 5%, respectively. Additional cobalt and copper mine production was exported after processing to intermediate products, such as cobalt carbonate, cobalt hydroxide, and black copper. Most or all Congolese diamond, niobium, tantalum, tin, and tungsten production was exported prior to downstream processing (table1; Banque Centrale du Congo, undated, p. 174–175).

Commodity Review

Metals

Cobalt, Copper, Germanium, and Silver.—In 2013, output at the Tenke Fungurume Mine increased to 209,774 metric tons (t) of refined copper and 12,751 t of contained cobalt in hydroxide from 157,671 t of refined copper and 11,669 t of contained cobalt in 2012. Production exceeded the mine's rated capacity of 195,000 metric tons per year (t/yr) of refined copper; the rated capacity of cobalt in cobalt hydroxide was 15,000 t/yr. In 2014, sales volumes were expected to be 202,000 t of refined copper and 13,600 t of contained cobalt. Tenke Fungurume was a joint venture of Freeport McMoran Copper & Gold Inc. of the United States (56%), Lundin Mining Corp. of Canada (24%), and Gécamines (20%) (Lundin Mining Corp., 2014, p. 21–22).

In 2013, Mutanda Mining SPRL (Glencore Xstrata plc of Switzerland, 69%, and Fleurette Properties Ltd., 31%) increased the capacity of its copper solvent extraction and electrowinning (SX-EW) plant at the Mutanda Mine to 200,000 t/yr from 110,000 t/yr. The plant had the capacity to produce 23,000 t/yr of cobalt in hydroxide. In 2013, output at Mutanda amounted to 150,600 t of copper, of which about 142,500 t was refined. In 2012, production was 83,500 t of refined copper and 3,500 t of copper in concentrate. Cobalt output in concentrate and hydroxide increased to about 13,700 t in 2013 from 8,500 t in 2012 (Hack, 2013; Glencore Xstrata plc, 2014, p. 7, 14; Kibawa, 2014).

Katanga Mining Ltd. of Canada produced copper and cobalt at the KOV and T17 open pit mines, the KTO underground mines, and the Luilu refinery. In 2013, production was 87,479 t of refined copper and 2,297 t of cobalt metal compared with 61,440 t of refined copper and 2,129 t of cobalt metal in 2012. Katanga also produced 48,713 t of copper in concentrate compared with 31,523 t in 2012. Higher production was attributable to increased ore mined at the KOV Mine (Katanga Mining Ltd., 2014, p. 6, 10–11).

At the end of 2013, Luilu had the capacity to produce 200,000 t/yr of refined copper. Katanga was engaged in a further expansion of its refined copper capacity to 260,000 t/yr and total copper capacity to 300,000 t/yr in 2014. The company also completed a feasibility study on the T17 Underground Mine in 2013; an investment decision was yet to be made at yearend (Bain, 2013b; Katanga Mining Ltd., 2014, p. 8).

Boss Mining SPRL [Eurasian Natural Resources Corp. Ltd. (ENRC) of the United Kingdom, 70%, and Gécamines, 30%] produced copper and cobalt at the Mukondo Mountain Mine and the Luita SX-EW plant. ENRC started mining at Comide in 2013. Total copper output at Mukondo Mountain and Comide increased to about 51,800 t from 35,200 t in 2012. Refined copper production increased to 28,985 t in 2013 from 24,368 t in 2012. Cobalt production increased to about 9,700 t in 2013 from 9,600 t in 2012 (Kitumba, 2013; Eurasian Natural Resources Corp. Ltd., 2014, p. 14; Kibawa, 2014).

ENRC planned to start mining at the Frontier Mine in July 2013 and to produce 40,000 t of copper in concentrate by yearend; actual production was 33,300 t in 2013. Output was expected to increase subsequently to 80,000 t/yr. ENRC planned to invest more than $1 billion during the next 5 years on increasing total production at its Congolese operation to 200,000 t/yr by 2017 (Bahamin, 2013; Eurasian Natural Resources Corp. Ltd., 2014, p. 14).

Anvil Mining Ltd. of Australia started a new SX-EW plant at the Kinsevere Mine in May 2011. In early 2012, Anvil was purchased by MMG Ltd. of China. MMG produced 62,076 t of refined copper at Kinsevere in 2013 compared with about 40,000 t in 2012; output exceeded the nameplate capacity of 60,000 t/yr. The company planned to produce between 61,000 and 65,000 t of refined copper at Kinsevere in 2014 (Anvil Mining Ltd., 2012; MMG Ltd., 2014).

Gécamines planned to produce a total of 50,000 t of copper at its Kamfundwa, Kamoya Central, Kamoya South, Kilamusembu, and Shangalowe Mines in 2013. Actual production was about 40,000 t compared with 35,015 t of copper in 2012; output was limited by power shortages. Refined copper

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production decreased to 15,456 t in 2013 from 18,742 t in 2012, and cobalt metal, to 700 t from 870 t. Gécamines also operated the Luswishi Mine, which had a capacity of 10,000 t/yr of copper and 4,000 t/yr of cobalt (Kitumba, 2013; Engineering & Mining Journal, 2013a; La Générale des Carrières et des Mines, 2013, p. 18; Cobalt Development Institute, 2014; Kibawa, 2014).

Gécamines planned to increase its copper production to 100,000 t/yr by 2015. Most of the increase in production was likely to take place at the Kamfundwa and the Kilamusembu Mines. The company planned to increase the total capacity of its concentrators by 50% in 2013. The capacity of the Shituru refinery was expected to increase to 30,000 t/yr in 2013 from 21,600 t/yr. At yearend, it was unclear whether the planned expansions had taken place (La Générale des Carrières et des Mines, 2013, p. 8, 18-19, 24; Engineering & Mining Journal, 2014b).

Gécamines and joint-venture partner Enterprise Generale Malta Forrest SPRL (EGMF) produced cobalt, copper, and germanium at La Société pour le Traitement du Terril de Lubumbashi's (STL) Big Hill tailings treatment plant in Lubumbashi. In 2013, OM Group Inc. sold its share in STL to EGMF and Gécamines. STL's capacity was about 5,500 t/yr of cobalt and 3,500 t/yr of copper. Cobalt production was 4,330 t in 2013; output was constrained by power shortages and technical problems. Germanium production increased to an estimated 18,000 kilograms (kg) in 2013 from 15,000 kg in 2012 (Construire L'Avenir, 2014).

Société d'Exploitation de Kipoi (Tiger Resources Ltd. of Australia, 60%, and Gécamines, 40%) started mining at the Kipoi Central deposit in 2011; output amounted to 41,255 t of copper in 2013. Tiger planned to produce 39,000 t of copper in concentrate at Kipoi Central in 2014; the first phase of the project was expected to shut down by yearend. In the second phase of the project, Tiger planned to open a new SX-EW plant at the Kipoi project with a capacity of 25,000 t/yr in the second quarter of 2014. Capacity at the SX-EW plant was expected to increase to 50,000 t/yr in the second quarter of 2015. The life of the second phase was estimated to be 9 years. Ore from the Kileba and the Kipoi North deposits was expected to feed the plant starting in 2018 and 2020, respectively (Tassell, 2014; Tiger Resources Ltd., 2014, p. 8).

Ruashi Mining SPRL (Jinchuan Group of China, 75%) produced cobalt and copper from the Ruashi Mine; refined copper and cobalt hydroxide were produced at the company's SX-EW plant. In 2013, output amounted to 34,647 t of refined copper and 3,045 t of contained cobalt compared with 26,976 t of refined copper and 3,035 t of contained cobalt in 2012. Production was limited by power supply problems in 2012; the increase in 2013 was attributable to the installation of new generators. At yearend, reserves were 13.1 million metric tons (Mt) at grades of 2.68% copper and 0.45% cobalt (Engineering & Mining Journal, 2014b; Jinchuan Group International Resources Co. Ltd., 2014, p. 12, 19).

In 2013, Jinchuan was engaged in reopening the Kinsenda Mine. The company planned to restart mining in 2015; production was likely to be 26,000 t/yr of copper in concentrate. Reserves at Kinsenda were estimated to be 6.1 Mt at a grade of 4.8% copper (Jinchuan Group International Resources Co. Ltd., 2014, p. 14, 19).

Jinchuan was engaged in a feasibility study of a new cobalt and copper mine at the Musonoi project in 2013. Resources at Musonoi were estimated to be 31.7 Mt at grades of 2.96% copper and 0.91% cobalt (Jinchuan Group International Resources Co. Ltd., 2014, p. 15, 18).

Mawson West Ltd. of Australia through Anvil Mining Congo SARL operated the Dikulushi Mine near Lake Mweru in Katanga Province. Dikulushi was the only Congolese silver-producing mine. In 2013, Mawson West produced 20,948 t of copper and 60,431 kg of silver compared with 5,818 t of copper and 12,342 kg of silver in 2012. The company planned to produce between 7,000 and 9,000 t of copper in 2014 as Dikulushi moved to underground mining (Mawson West Ltd., 2014, p. 11–12).

Mawson West planned to commission the Kapulo project in the first quarter of 2014. Kapulo was likely to produce more than 20,000 t/yr of copper in concentrate from a new mine with an estimated life of 6 years. The life of the mine could be extended to 10 years depending on reserves at the Safari North and the Safari South deposits (Avery, 2013).

Chemaf SPRL produced copper and cobalt at the Etoile Mine and the Usoke Avenue copper SX-EW and cobalt carbonate plants. In 2013, Chemaf produced 19,124 t of refined copper compared with 19,150 t in 2012 and 20,191 t in 2011. Output of cobalt in carbonate and hydroxide decreased to 1,170 t in 2013 from 1,278 t in 2012 and 2,155 t in 2011. Decreased cobalt production was attributable to lower cobalt grades. By 2016, Chemaf planned to increase refined copper capacity to 50,000 t/yr from 31,500 t/yr, and cobalt capacity, to 6,000 t/yr from 2,400 t/yr (Engineering and Mining Journal, 2013a; Shalina Resources Ltd., 2014).

Black copper, which is an intermediate product that has a copper content of between 80% and 98%, was produced by numerous companies in Katanga Province. Some companies produced black copper from concentrate produced at their own mines and others sourced concentrate from artisanal miners. In 2013, Congo Dong Fang International Mining SPRL (CDM) of China produced nearly 25,000 t of copper in black copper; Rubamin SPRL (a subsidiary of Rubamin Ltd. of India), about 14,000 t; and Congo Loyal Will Mining SPRL of Hong Kong, about 4,400 t (Kibawa, 2014).

CDM, La Minière de Kalumbwe Myunga (MKM), Minière du Katanga SPRL (Somika) of India, Shituru Mining Corp., and other companies operated small copper refineries. In 2013, Shituru Mining produced 22,636 t of refined copper; MKM, 14,278 t; CDM, 11,423 t; and Somika, 7,168 t. Somika's production capacity was 12,000 t/yr of refined copper and 8,000 t/yr of black copper. By 2015, the company planned to increase its production capacity to 50,000 t/yr of copper, most of which was expected to be refined and black copper (Engineering & Mining Journal, 2013a; Kibawa, 2014).

In 2013, Somika produced more than 600 t of cobalt; the company's production capacity was 3,000 t/yr of cobalt in hydroxide. Somika was considering the production of cobalt metal. CDM mined more than 2,400 t of cobalt; and Metals Mines, about 900 t (Engineering & Mining Journal, 2013a; Kibawa, 2014).

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In its first preliminary economic assessment (PEA) of a new mine at its Kamoa project, Ivanhoe Mines Ltd. of Canada planned to produce 143,000 t/yr of copper in concentrate. In December 2013, Ivanhoe completed a new PEA with positive results. The company planned to start construction on the mine in early 2014 and mining in 2017. In the first phase of mining, Ivanhoe planned to produce about 100,000 t/yr of copper in concentrate. Ivanhoe planned to start the second phase in 2022; output was likely to be 306,000 t/yr of blister copper. Capital costs in the first phase of the project were estimated to be $1.4 billion, and in the second phase, an additional $3.5 billion. Indicated resources were estimated to be 739 Mt at a grade of 2.67% copper. The planned life of the mine was 30 years (Engineering & Mining Journal, 2013b, 2014b; Northern Miner, 2013).

Gold.—Artisanal and small-scale miners produced gold in the Ituri Interim Administration, Nord-Kivu Province, and Sud-Kivu Province in eastern Congo (Kinshasa). Most gold exports were undeclared; most Congolese gold production reportedly was smuggled through Burundi and Uganda. In 2012, between 5,000 and 7,000 kilograms per year (kg/yr) of gold was produced at 15 large mines and between 70 and 100 smaller mines in Nord-Kivu and Sud-Kivu Provinces. Between 6,000 and 7,000 kg/yr was produced at 813 sites in Ituri Interim Administration, which included 343 sites in Mambasa Territory, 230 sites in Djugu Territory, and 209 sites in Irumu Territory (Enough Project, 2012, p. 2–4, 7, 14; United Nations Group of Experts, 2012, p. 5; van Puijenbroek and others, 2012, p. 11).

Armed groups in eastern Congo (Kinshasa) including the Forces Démocratiques de Libération du Rwanda and units of the Congolese armed forces obtained revenue from the illegal taxation of artisanal and small-scale miners. The majority of the conflict gold mines reportedly were located in Sud-Kivu Province (Enough Project, 2012, p. 3–4; United Nations Group of Experts, 2012, p. 25, 30, 34–35).

In October 2011, Banro Corp. of Canada started production at the new Twangiza Mine in Sud-Kivu Province. The company produced 2,569 kg of gold in 2013; output was expected to be between 3,100 and 3,400 kg in 2014. By the end of 2013, Banro had nearly completed an expansion of its processing plant that would increase its capacity to between 3,400 and 3,700 kg/yr. Resources at Twangiza were estimated to be 128 Mt at a grade of 1.54 grams per metric ton (g/t) gold, of which 13.7 Mt at a grade of 2.34 g/t gold was reserves (Bain, 2013a; Banro Corp., 2014, p. 5, 8–9, 13).

Banro started mining ore at the new Namoya Mine in Sud-Kivu Province in late December 2013. The company planned to complete construction in April 2014 and to produce about 3,900 kg/yr of gold at Namoya. Resources at Namoya were estimated to be 36.3 Mt at a grade of 2.06 g/t gold, of which 23.7 Mt at a grade of 1.75 g/t gold was reserves. Banro also revised its estimate of resources at the Lugushwa project to 88.1 Mt at a grade of 1.5 g/t gold; resources at the Kamituga project were estimated to be 7.26 Mt at a grade of 3.94 g/t gold. The company planned further exploration at Kamituga and Lugushwa in 2014 (Banro Corp., 2014, p. 15–16).

AngloGold Ashanti Ltd. of South Africa and Randgold Resources Ltd. of the United Kingdom started operations at the Kibali Mine in 2013; the companies produced more than 2,700 kg of gold by yearend. Production was likely to be 17,000 kg in 2014 and an average of 18,700 kg/yr during the first 12 years of the mine's life. Mining at Kibali was expected to continue until 2031. Reserves at Kibali were estimated to be 88 Mt at a grade of 4 g/t gold (Randgold Resources Ltd., 2014, p. 44–47).

AngloGold Ashanti and state-owned l'Office des Mines d'Or de Kilo-Moto (OKIMO) held the Mongbwalu concession, which is located in the Ituri Interim Administration. Reserves at Mongbwalu were estimated to be nearly 78 t of contained gold. AngloGold Ashanti and OKIMO had planned to start mining at Mongbwalu by the end of 2013; production was expected to be about 4,000 kg/yr for the first 3 years. The development of Mongbwalu was suspended in May 2013 (Bahamin, 2012; AngloGold Ashanti Ltd., 2014, p. 131).

In October 2013, Mwana Africa plc of the United Kingdom revised its estimate of contained gold resources at the Zani Kodo project to nearly 93,000 kg. Mwana Africa was considering the development of a new mine at Zani Kodo. Depending on the results of its feasibility study, the company could produce between 4,700 and 7,800 kg/yr of gold. Production was planned to start by the end of 2015. At yearend, Mwana Africa put the project on hold temporarily (Williams, 2013; African Mining, 2014).

In December 2013, Armadale Capital plc of the United Kingdom estimated that resources at the Mpokoto project in southwestern Katanga Province were 11.2 Mt at a grade of 1.42 g/t gold. Armadale planned further exploration in 2014 (Modern Mining, 2014).

Niobium (Columbium), Tantalum, and Tin.—Exports of columbite-tantalite were 500 t in 2013 compared with 586 t in 2012. In 2013, exports of columbite-tantalite from Katanga Province were 423 t. Most niobium and tantalum in Katanga Province was produced from mixed cassiterite and columbite-tantalite ore, which was separated into cassiterite and columbite-tantalite before export. In 2013, mines in Malemba Nkulu Territory accounted for 66% of mixed cassiterite and columbite-tantalite output; Manono Territory, 32%; and Nyunzu Territory, 1%. Miners in Nyunzu Territory produced 134 t of columbite-tantalite in 2013; in Bukama/Luena Territory, 17 t; and Kalemie Territory, 7 t (Chambre des Mines, 2014, p. 19; International Tin Research Institute, 2014a).

Niobium and tantalum were also contained in cassiterite. Based on historical production of niobium and tantalum from slag at smelters in Congo (Kinshasa), the estimated tantalum and niobium content of cassiterite in 2013 was 110 t and 90 t, respectively (World Mining, 1979; Ellis, 1981).

Artisanal and small-scale miners produced cassiterite in Katanga, Maniema, Nord-Kivu, and Sud-Kivu Provinces. In 2013, reported cassiterite exports decreased to 6,231 t from 8,018 t in 2012 and 15,512 t in 2009. Exports from Nord-Kivu and Sud-Kivu Provinces declined because of the ban on mining operations in Maniema, Nord-Kivu, and Sud-Kivu Provinces from September 2010 through early March 2011; the Government's requirement that mineral production from Maniema Province be exported through Katanga Province; the Government's suspension of trading companies in Goma that reportedly purchased uncertified minerals from mines near Walikale; and the decline in prices for minerals that were not

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compliant with iTSCi (United Nations Group of Experts, 2012, p. 40, 46; Johnson, 2013, p. 52).

In 2013, cassiterite exports from Katanga Province were 4,124 t. The Malemba Nkulu Territory accounted for 832 t of cassiterite production in Katanga Province in 2013; the Mitwaba Territory, 675 t; the Lubudi Territory, 472 t; the Bukama/Luena Territory, 287 t; and the Manono Territory, 268 t. Cassiterite was also produced from mixed cassiterite and columbite-tantalite ores in Katanga Province. Reported output from the Pangi Territory in Maniema Province was 990 t in 2013, and the Kalehe Territory in Sud-Kivu Province, 489 t (Chambre des Mines, 2014, p. 18; International Tin Research Institute, 2014a).

Mining Mineral Resources (MMR), which was a subsidiary of Somika, purchased cassiterite and columbite-tantalite from artisanal miners. In 2012, MMR and joint-venture partner Malaysian Smelting Corporation Berhad of Malaysia completed a new tin smelter in Lubumbashi with a capacity of 3,600 t/yr. At the end of 2013, production had not started because of the lack of a reliable supply of power. African Smelting Group SPRL completed a new smelter at Sake in Nord-Kivu Province; it was unclear whether the plant was operating at yearend (Malaysian Smelting Corporation Berhad, 2014, p. 22).

Tungsten.—In recent years, wolframite was mined in Katanga, Nord-Kivu, and Sud-Kivu Provinces. Production was reduced because of the depletion of near-surface deposits on Idjwi Island in Sud-Kivu Province. National production of wolframite decreased to 57 t in 2013 from 71 t in 2012 (table 1).

Industrial Minerals

Cement.—National cement production increased to 446,610 t in 2013 from a revised 413,181 t in 2012; cement consumption increased to 420,975 t from 385,206 t. HeidelbergCement AG of Germany held a 70% share in Interlacs and a 55% share in Cimenterie du Lukala, which had a combined capacity of about 500,000 t/yr. Nova Cimangola of Angola held a 58% share in Cimenterie Nationale SARL, which had a capacity of 300,000 t/yr (Banque Centrale du Congo, 2014, p. 3).

Lucky Cement Ltd. of Pakistan and Groupe Rawji were engaged in a joint venture to build a new cement plant with a capacity of 1.2 million metric tons per year (Mt/yr). The companies planned to complete the plant at Songololo in Bas-Congo Province in the second half of 2015. In the fourth quarter of 2013, PPC Ltd. of South Africa signed an agreement with joint-venture partner Barnet Group to build a new plant at Kimpese in Bas-Congo Province with a capacity of 1 Mt/yr. The construction of the plant was likely to be completed after 2 years (International Cement Review, 2013a, b).

Diamond.—Artisanal and small-scale miners accounted for most Congolese output of diamond; the majority of artisanal and small-scale diamond mining was in Kasai-Occidental and Kasai-Oriental Provinces. In 2013, artisanal and small-scale diamond production was 17.8 million carats compared with a revised 21.5 million carats in 2012. Decreased production was attributable to the Government's new system of mining permits for artisanal miners that reduced the areas available for diamond mining (Chambre des Mines, 2014, p. 18; Research and Markets, 2014).

MIBA mined mostly industrial and near-gem-quality diamond at Mbuji-Mayi in Kasai-Oriental Province. In 2013, MIBA's production from its alluvial deposits was 174,262 carats compared with 500,726 carats in 2012 because of decreased amounts of gravel processed and the lowest grade since at least 1980 (Chambre des Mines, 2014, p. 13).

In 2011, Government-owned Société Congolaise d'Investissment Minier (SCIM) restarted diamond production at Tshibwe, which was operated by Sengamines from 2001 to 2005. In 2013, Anhui Foreign Economic Construction Group of China and the Government formed Societe Anhui-Congo d'Investissment Minier SPRL, which was a new joint-venture company to replace SCIM. By 2016, Anhui and the Government planned to mine 6 million carats per year at Tshibwe. Reserves at Tshibwe were estimated to be 158 million carats (Kavanagh, 2013).

Nickel Mountain Group AB of Sweden (formerly IGE Resources AB) held exploitation and small mining licenses for the Longatshimo River and the Tshikapa River projects. The development of the projects was put on hold in early 2013; Nickel Mountain decided to spin off its Congolese assets into a separate company in the fourth quarter (Nickel Mountain Group AB, 2014, p. 8, 10).

Phosphate Rock.—Minbos Resources Ltd. of Australia held the Kanzi deposit in western Congo-Kinshasa, which had estimated resources of 66 Mt at a grade of 15.3% phosphorus pentoxide (P_2O_5). In November 2012, Minbos completed a scoping study on a new mine at Kanzi that yielded favorable results; production was likely to be about 1 Mt/yr of phosphate rock at a grade of about 32% P_2O_5 during an estimated 17-year mine life. In the third quarter of 2013, Minbos announced plans to divest its Congolese assets to focus on phosphate resources in Angola (Minbos Resources Ltd., 2012, 2013).

Mineral Fuels

Coal.—Gecamines reopened the Luena Mine in 2011 and produced small amounts of coal. In 2013, the company started a feasibility study on a new coal-fired power station with a capacity of 500 megawatts. The power station would be supplied by coal from the Luena Mine (Engineering & Mining Journal, 2014b).

Outlook

Cobalt and copper output in Congo (Kinshasa) are expected to increase in the near future. At least nine companies planned to increase or start copper mining, and at least four planned to increase cobalt mining. Gold production is also likely to increase because of the opening of the Kibali and the Namoya Mines. The opening of new plants is expected to result in increased cement production by late 2015. Diamond mining could also increase because of the expansion at Tshibwe. The development of these projects will depend heavily upon adequate power supplies, political and economic stability, and favorable conditions in world markets. In 2013, Jinchuan and other companies were engaged in discussions about cooperating on power supply issues.

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The outlook for gold, niobium, tantalum, tin, and tungsten is particularly dependent upon political stability because of continued civil unrest in eastern Congo (Kinshasa) and upon international concerns about the reported use of minerals to finance armed groups. Miners in Provinces with low levels of compliance with iTSCi were likely to face lower demand and prices for niobium, tantalum, tin, and tungsten.

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TABLE 1
CONGO (KINSHASA): PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
METALS						
Cobalt:						
Mine output, Co content[e, 3]		40,000	60,000	63,000 r	52,000 r	58,000
Metal, Co content[4]		2,950 r	4,222	3,103	3,021	3,007
Copper:						
Mine output, Cu content[e]		330,000	420,000	530,000	660,000	970,000
Refined		166,915	260,759	362,000	473,000 r	684,653
Germanium, mine output, Ge content[e]	kilograms	19,000	17,000	21,000	15,000 r	18,000
Gold, mine output, Au content[e]	do.	11,000	12,000	12,000	14,000	17,000
Niobium (columbium) and tantalum:						
Columbite-tantalite concentrate:						
Gross weight[5]		464 r	440 r	536 r	586 r	500
Nb content[e]		80 r	80 r	90 r	100 r	90
Ta content[e]		100 r	100 r	120 r	130 r	110
Pyrochlore concentrate:						
Gross weight[5]		80 e	--	--	--	--
Nb content		40 e	--	--	--	--
Cassiterite concentrate:						
Gross weight[5]		15,512 r	13,415 r	9,267 r	8,018 r	6,231
Nb content[e]		150	130	90	80	60
Ta content[e]		220	190	140	120	90
Silver, mine output, Ag content	kilograms	--	6,446	10,080	12,342	60,431
Steel, crude		NA r	NA r	NA r	NA r	NA
Tin, mine output, cassiterite concentrate:						
Gross weight[5]		15,512 r	13,415 r	9,267 r	8,018 r	6,231
Sn content[e]		9,300 r	8,000 r	5,600 r	4,800 r	3,700
Tungsten, mine output, concentrate:						
Gross weight[5]		365 r	45 r	87 r	71 r	57
W content[e]		170 r	21 r	41 r	35 r	27
Zinc, mine output, Zn content		12,843 r	9,223	12,342 r	10,571 r	12,566
INDUSTRIAL MINERALS						
Cement, hydraulic		460,344	489,745	457,761	413,181 r	446,610
Diamond:[6]						
Artisanal	thousand carats	21,298 r	20,166 r	19,249 r	21,524 r	17,799
Large-scale	do.	-- r	--	244 r	569 r	246
Total	do.	21,298 r	20,166 r	19,493 r	22,093 r	18,045
Stone, crushed		253,800	279,100	307,000	337,800 r	340,000 e
Sulfuric acid[e]		550,000	850,000	1,200,000	1,600,000	2,300,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous		--	-- e	1,469	3,870	4,000 e
Petroleum, crude	thousand 42-gallon barrels	9,382	8,628	8,558	8,545	8,351

See footnotes at end of table.

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TABLE 1—Continued
CONGO (KINSHASA): PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. NA Not available. -- Zero.
[1]Table includes data available through February 27, 2015.
[2]In addition to the commodities listed, tourmaline and crude construction materials, including brick clay, are produced, but available information is inadequate to make reliable estimates of output.
[3]Includes mine production and reprocessed tailings.
[4]Salable refined production only; excludes white alloy and matte.
[5]Reported exports.
[6]An estimated 20% of total diamond is gem quality; the majority of production is from artisanal mining.

TABLE 2
CONGO (KINSHASA): STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Cimenterie de Lukala (HeidelbergCement AG, 55%)	Lukala plant near Kinshasa	420,000.
Do.	Cimenterie Nationale SARL (Nova Cimangola, 58%)	Kimpese plant, 40 kilometers south of Kinshasa	300,000.
Do.	Ciment et Matériaux du Katanga [Enterprise Malta Forrest SPRL (EGMF), 50.27%, and Générale des Carrières et des Mines (Gécamines), 49.73%]	Lubudi plant, between Likasi and Kolwezi, Katanga Province	87,000.
Do.	Interlacs (HeidelbergCement AG, 70%)	Kabimba plant near Lubumbashi	50,000.
Do.	do.	Katana plant in Sud-Kivu Province[1]	25,000.
Coal	La Générale des Carrières et des Mines (Gécamines)	Luena Mine	NA.
Copper and cobalt:			
Mine	Katanga Mining Ltd. [Glencore Xstrata plc, 75.2%, and Générale des Carrières et des Mines (Gécamines), 24.8%]	KOV and KTO Mines	250,000 copper;[e] 8,000 cobalt.[e]
Do.	Mutanda Mining SPRL (Glencore Xstrata plc, 69%, and Fleurette Properties Ltd., 31%)	Mutanda Mine	200,000 copper;[e] 23,000 cobalt.[e]
Do.	Tenke Fungurume Mining SARL [Freeport McMoran Copper & Gold Inc., 56%; Lundin Mining Corp., 24%; Générale des Carrières et des Mines (Gécamines), 20%]	Tenke Fungurume Mine	195,000 copper; 15,000 cobalt
Do.	Eurasian Natural Resources Corp. plc (ENRC)	Frontier Mine	80,000 copper.
Do.	Boss Mining SPRL [Eurasian Natural Resources Corp. plc (ENRC), 70%, and Générale des Carrières et des Mines (Gécamines), 30%]	Mukondo Mountain Mine	40,000 copper;[e] 10,000 cobalt.[e]
Do.	Eurasian Natural Resources Corp. plc (ENRC)	Comide Mine	30,000 copper.[e]
Do.	La Générale des Carrières et des Mines (Gécamines)	Kamfundwa, Kamoya Central, Kamoya South, Kilamusembu, and Shangalowe Mines	50,000 copper;[e] 2,500 cobalt.[e]
Do.	Compagnie Minière du Sud Katanga [subsidiary of La Générale des Carrières et des Mines (Gécamines)]	Luiswishi Mine near Lubumbashi	10,000 copper; 4,000 cobalt.
Do.	MMG Ltd.	Kinsevere Mine	60,000 copper.

See footnotes at end of table.

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TABLE 2—Continued
CONGO (KINSHASA): STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper and cobalt—Continued:				
Mine		Artisanal miners	Mines in Katanga Province	45,000 copper.[e]
Do.		Congo Dong Fang International Mining SPRL	do.	40,000 copper;[e] 1,900 cobalt.[e]
Do.		Tiger Resources Ltd., 60%, and La Générale des Carrières et des Mines (Gécamines), 40%	Kipoi Mine	40,000 copper.
Do.		Ruashi Mining SPRL [Metorex Group, 75% (subsidiary of Jinchuan Group)]	Ruashi Mine	36,000 copper; 5,000 cobalt.
Do.		Chemaf SPRL (subsidiary of Shalina Resources Ltd.)	Etoile Mine	31,500 copper;[e] 2,400 cobalt.[e]
Do.		Shituru Mining Corp. SPRL	Mines in Katanga Province	30,000 copper[e].
Do.		Société Minière du Katanga SPRL (Somika)	do.	20,000 copper;[e] 3,000 cobalt.
Do.		Anvil Mining Congo SARL (Mawson West Ltd., 90%)	Dikulushi Mine	20,000 copper.
Do.		La Société pour le Traitement du Terril de Lubumbashi (STL) [Enterprise Générale Malta Forrest SPRL (EGMF), 70%, and La Générale des Carrières et des Mines (Gécamines), 30%]	Big Hill tailings treatment plant at Lubumbashi	3,500 copper; 5,500 cobalt.
Black copper		Congo Dong Fang International Mining SPRL	Plant in Lubumbashi	25,000 copper.[e]
Do.		Congo Loyal Will Mining SPRL	do.	20,000 copper.[e]
Do.		Rubamin SPRL	Plant in Likasi	20,000 copper.
Do.		Société Minière du Katanga SPRL (Somika)	Plant near Lubumbashi	8,000 copper.
Refined		Katanga Mining Ltd.	Luilu plant	200,000 copper; 8,000 cobalt.
Do.		Mutanda Mining SPRL	Mutanda plant	200,000 copper.
Do.		Tenke Fungurume Mining SARL	Tenke Fungurume plant	195,000 copper.
Do.		MMG Ltd.	Kinsevere plant	60,000 copper.
Do.		Boss Mining SPRL	Luita plant near Lubumbashi	40,000 copper.
Do.		Ruashi Mining SPRL	Ruashi plant	36,000 copper.
Do.		Chemaf SPRL	Usoke Avenue plant in Lubumbashi	31,500 copper.
Do.		Congo International Mining Corp.	Plant in Katanga Province	30,000 copper.
Do.		Shituru Mining Corp. SPRL	do.	30,000 copper.
Do.		La Générale des Carrières et des Mines (Gécamines)	Shituru plant	21,600 copper.
Do.		do.	Fonderie Electrique de Panda cobalt plant	1,200 cobalt.
Do.		Société Minière du Katanga SPRL (Somika)	Plant near Lubumbashi	12,000 copper.
Diamond	carats	Artisanal miners	Mines at Aketi in Orientale Province, at Bakongo, Bakwachimuna, and Tshibue in Kasai-Oriental Province, and at Tshikapa in Kasai-Occidental Province	20,000,000.[e]
Do.	do.	Société Minière de Bakwanga (MIBA) [Government, 80%, and Sibeka Group, 20% (which was owned by Mwana Africa plc)]	Mines at Mbuji Mayi in Kasai-Oriental Province	1,000,000.[e]
Do.	do.	Societe Anhui-Congo d'Investissment Minier SPRL (Anhui Foreign Economic Construction Group and Government)	Mine at Tshibwe	600,000.
Germanium	kilograms	La Société pour le Traitement du Terril de Lubumbashi (STL)	Big Hill tailings treatment plant at Lubumbashi	20,000.

See footnotes at end of table.

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TABLE 2—Continued
CONGO (KINSHASA): STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold	kilograms	Artisanal and small-scale miners	Mines at 813 sites in Ituri Interim Administration, including:	6,000.[e]
Do.	do.	do.	343 sites in Mambasa Territory	NA.
Do.	do.	do.	230 sites in Djugu Territory	NA.
Do.	do.	do.	209 sites in Irumu Territory	NA.
Do.	do.	do.	15 large mines and between 70 and 100 smaller mines at various sites in Nord-Kivu and Sud-Kivu Provinces	6,000.[e]
Do.	do.	AngloGold Ashanti Ltd., 45%, and Randgold Resources Ltd., 45%	Kibali Mine in Ituri District	18,700.
Do.	do.	Banro Corp.	Namoya Mine in Maniema Province	3,900.
Do.	do.	do.	Twangiza Mine in Sud-Kivu Province	3,100.
Niobium (columbium) and tantalum		Société Minière du Kivu (Simikivu) [GfE Metalle und Materialien GmbH of Germany, 70%]	Lueshe Mine[1]	1,440 pyrochlore.
Do.		Artisanal and small-scale miners	Mines in Malemba Nkulu Territory	180 columbite-tantalite.[e]
Do.		do.	Mines in Nyunzu Territory	140 columbite-tantalite.[e]
Do.		do.	Mines in Manono Territory	90 columbite-tantalite.[e]
Do.		do.	Mines in Bukama/Luena Territory	20 columbite-tantalite.[e]
Do.		do.	Mines in Kalemie Territory	10 columbite-tantalite.[e]
Petroleum, crude	thousand 42-gallon barrels	Perenco REP (subsidiary of Perenco plc) and Congolaise des Hydrocarbures SARL	Kifuku, Kinkasi, Liawenda, Makelekese, Muanda, Nsiamfuma, and Tschiende onshore wells	5,480.
Do.	do.	Muanda International Oil Co. (Perenco plc, 50%; Teikoku Oil Co. Ltd., 32.3%; ODS Ltd., 17.7%)	Mibale, Motoba, and Tshiala offshore wells	3,650.
Silver	kilograms	Anvil Congo Mining SARL	Dikulushi Mine	60,000.
Stone, crushed		Chemaf SPRL	Kilimasimba quarry near Lubumbashi	440,000.
Sulfuric acid		La Générale des Carrières et des Mines (Gécamines)	Sulfuric acid plants at Kolwezi and Shituru	NA.
Do.		Chemaf SPRL	Plant in Lubumbashi	36,000.
Tin:				
Mine		Artisanal and small-scale miners	Mines in Malemba Nkulu Territory	2,000 cassiterite.[e]
Do.		do.	Mines in Pangi Territory	1,000 cassiterite.[e]
Do.		do.	Mines in Manono Territory	800 cassiterite.[e]
Do.		do.	Mines in Kalehe Territory	500 cassiterite.[e]
Do.		do.	Mines in Lubudi Territory	500 cassiterite.[e]
Do.		do.	Mines in Bukama/Luena Territory	300 cassiterite.[e]
Do.		do.	Mines in Kailo Territory	200 cassiterite.[e]
Refined		Malaysian Smelting Corp. Bhd. and Mining Mineral Resources	Plant in Lubumbashi[1]	3,600.
Tungsten		do.	Mines in Bukama/Luena Territory	58 wolframite.[e]
Do.		do.	Mines in Manono Territory	33 wolframite.[e]
Zinc		La Société pour le Traitement du Terril de Lubumbashi (STL)	Big Hill tailings treatment plant at Lubumbashi	15,000 zinc in zinc oxide.

[e]Estimated. Do., do. Ditto. NA Not available.
[1]Not operating at the end of 2013.

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The Mineral Industries of Côte d'Ivoire and Togo

By Omayra Bermúdez-Lugo

CÔTE D'IVOIRE

Mineral commodities produced in Côte d'Ivoire in 2013 included crude petroleum, gold, manganese ore, natural gas, petroleum products, and silver. In addition to these commodities, the country also produced industrial minerals, such as cement, crushed stone, and sand and gravel. Although rough diamond exports continued to be under a United Nations embargo, on May 30 the Government signed a Ministerial decree that allowed for the production of diamond within mining areas managed by Société pour le Développement Minier de la Côte d'Ivoire (SODEMI). SODEMI is the Government agency in charge of overseeing all prospecting and exploration activities in the mining sector. The country also produced sulfuric acid, but available information was inadequate to make reliable estimates of output. Côte d'Ivoire was a participant in the Extractive Industries Transparency Initiative (EITI) and has been compliant with EITI standards since it became a candidate country in 2008 (United Nations Security Council, 2013, p. 19–20; Extractive Industries Transparency Initiative, 2014).

The Bonikro, the Ity, and the Tongon Mines together produced 12,862 kilograms (kg) of gold in 2013, an increase of about 16.7% compared with production in 2012. Production from the Tongon Mine was expected to increase by 12% in 2014, to reach nearly 8,000 kg. Production from the Yaoure Mine was discontinued in 2012, and the mine remained closed in 2013, as Amara Mining plc of the United Kingdom focused on the development of a mineralized sulfide zone underlying the mine's lower grade oxides. A preliminary economic assessment of the Yaoure Mine's gold sulfide deposits yielded indicated resources of 20.3 million metric tons (Mt) with an average grade of 1.2 grams per metric ton (g/t) gold at a cutoff grade of 0.5 g/t gold. Yaoure Mine's inferred resources were estimated to be 133 Mt with an average grade of 1.29 g/t gold at a cutoff grade of 0.5 g/t gold. Based on the results of this assessment, Amara Mining reported that the Yaoure Mine had the potential to produce more than 10,000 kilograms per year (kg/yr) of gold. If the envisioned production is realized, the Yaoure Mine could become one of West Africa's top 10 gold mines in terms of output capacity. An infill drilling program for Yaoure was scheduled for 2014, and a preliminary feasibility study was expected to be completed in the first quarter of 2015 (Amara Mining plc, 2014, p. 5; Newcrest Mining Ltd., 2014, p. 17; Randgold Resources Ltd., 2014, p. 39).

Construction work at the Agbaou gold mine was completed on November 29. Precommercial production for the months of November and December was reported to be 190 kg of gold. Full commercial production was scheduled to begin in January 2014. The Agbaou Mine was expected to produce between 2,600 and 3,000 kg/yr of gold and to have a mine life of 12 years. Endeavour Mining Corp. of Canada, which operated the mine, held an 85% interest in the mine through its subsidiary Agbaou Gold Operations S.A. (Endeavour Mining Corp., 2014, p. 1, 7).

Manganese ore production increased by 119% to 220,300 metric tons, mostly as a result of the resumption and ramping up of production at the Lauzoua/Mokta Mine. Plans to build a 50,000-metric-ton-per-year (t/yr) manganese beneficiation plant in the Grand Lahou region were put on hold as the region was experiencing problems with shortages of electricity supply (Africa Mining Intelligence, 2013a, b).

International mining companies continued to carry out exploration activities for gold, iron ore, manganese, and nickel. Tata Steel Ltd. of India explored for iron ore within the subprefectures of Bangolo and Logouale in the region of Man in partnership with SODEMI. Sama Resources Inc. of Canada explored for cobalt, copper, and nickel in northwestern Côte d'Ivoire. Several Australian companies including Apollo Consolidated Ltd., Perseus Mining Ltd., and Taruga Gold Ltd. explored for gold in northern and central Côte d'Ivoire near the towns of Bonikro, Mankono, Seguela, Tengrela, and Tongon (Apollo Consolidated Ltd., 2013; Golden Rim Resources Ltd., 2013; Mieu, 2013; Taruga Gold Ltd., 2013; Sama Resources Inc., 2014, p. 2–8).

Table 1 provides data on the principal mineral commodities produced in Côte d'Ivoire from 2009 to 2013, and table 2 provides a list of major mineral industry facilities in 2013. More-extensive coverage of the mineral sector of Côte d'Ivoire can be found in the 2011 and 2012 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available at http://minerals.usgs.gov/minerals/pubs/country/.

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TOGO

Mineral commodities produced in Togo included cement, diamond, gold, iron ore, limestone, and phosphate rock. In addition to these commodities, Togo also produced clay, marble, and sand and gravel, but available information was inadequate to make reliable estimates of output. In 2013, HeidelbergCement AG of Germany continued with its plans to build a new 1.5-million-metric-ton-per-year clinker plant, which was expected to be commissioned by the end of 2014. The company also planned to construct a cement grinding facility capable of processing about 200,000 t/yr of cement, which was scheduled to be commissioned in 2016. The clinker plant will be located in the city of Tabligbo, which is located about 80 kilometers (km) northeast of the capital city of Lome, and the cement grinding facility will be located in the city of Dapaong, which is located about 600 km north of Lome (HeidelbergCement AG, 2014, p. 66, 71).

Ferrex plc of the United Kingdom announced in September a revised Joint Ore Reserves Committee (JORC) Code-compliant resource estimate for its Nayega manganese project. The revised estimate, which was derived from the sampling of 39 infill pits, yielded an indicated and measured resource of 11 Mt of manganese ore at a grade of 13.1% manganese. A definitive feasibility study for Nayega was underway and was expected to be completed upon approval of a mining license. The project is located about 600 km north of the capital city of Lome and is accessible by a major road that connects the deposit to the deepwater Port of Lome. Ferrex held an 85% interest in the Nayega project through Société Générale des Mines, which is a Togolese company (Ferrex plc, 2014, p. 6).

Table 1 provides data on the principal mineral commodities produced in Togo from 2009 to 2013, and table 2 provides a list of major mineral industry facilities in 2013. More-extensive coverage of the mineral sector of Togo can be found in the 2011 and 2012 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available at http://minerals.usgs.gov/minerals/pubs/country/.

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TABLE 1

CÔTE D'IVOIRE AND TOGO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and Commodity		2009	2010	2011	2012	2013
CÔTE D'IVOIRE[2, 3]						
Cement[4]		283,400	188,800	98,900	78,000	80,000 e
Gold, mine output, Au content[5]	kilograms	6,947	5,310	9,871	11,027 r	12,862
Manganese ore:						
Gross weight[6]		161,300	87,400	43,600	100,400	220,300
Mn content (43% to 45%)		72,585	39,330	19,620	45,200	99,100
Natural gas	million cubic meters	1,540	1,666	1,632	1,780	1,700 e
Petroleum:						
Crude	thousand 42-gallon barrels	19,882	14,562 r	12,391	10,770	9,141
Refinery products	do.	25,000	20,400	20,000 e	25,000 e	25,000 e
Sand and gravel	cubic meters	NA	93,200	90,000 e	80,000 e	80,000 e
Silver[e]		100	200	400	500	500
Stone, crushed, granite[7]	thousand metric tons	1,005	1,095	1,100 e	1,460	1,500 e
TOGO[8]						
Cement:						
Clinker	thousand metric tons	1,050	1,060 e	1,201	897 r, 9	866 9
Hydraulic	do.	1,179 10	1,185 10	1,160 10	1,173 r, 9	1,233 9
Diamond[11]	carats	125	96	71	456	68
Gold[12]	kilograms	12,955	10,452	16,469	18,551 r	19,000 e
Iron ore:						
Gross weight		NA	NA	40,912	52,706 r	50,000 e
Fe content (30%)		NA	NA	12,300 e	15,800 r, e	15,000 e
Limestone	thousand metric tons	1,704 13	1,656	1,923	1,919 r	1,900
Phosphate rock, beneficiated product:						
Gross weight	thousand metric tons	726	695	866	1,159 r, 9	1,214 9
P_2O_5 content	do.	260	250	310 e	420 r, e	440 e

eEstimated; estimated data are rounded to no more than three significant digits. rRevised. do. Ditto. NA Not available.

[1]Table includes data available through December 31, 2014.

[2]Although rough diamond exports continued to be under a United Nations embargo, rough diamond production was thought to be continuing, but available information was inadequate to make reliable estimates of output.

[3]In addition to the commodities listed, Côte d'Ivoire also produced sulfuric acid, but available information was inadequate to make reliable estimates of output.

[4]Based on reported exports of hydraulic cement.

[5]Does not include production from artisanal mining or precommercial production from the Agbaou Mine.

[6]Reported by the International Manganese Institute.

[7]The crushed stone series, which before 2007 was reported to be exports of gravel and crushed stone, has been revised to reflect crushed stone data only as reported by the Ministry of Mines, Petroleum, and Energy.

[8]In addition to the commodities listed, Togo also produced clay, marble, and sand and gravel, but information was inadequate to make reliable estimates of output.

[9]Reported by the Direction Générale de la Statistique et de la Comptabilité Nationale.

[10]Reported by the Banque Centrale des Etats de l'Afrique de l'Ouest.

[11]Reported by the Kimberley Process Certification Scheme.

[12]May include artisanal gold production from neighboring countries; however, information was inadequate to make reliable estimates of how much of total reported output originated in other countries.

[13]Limestone quarried for cement production as reported by the Ministry of Mines.

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TABLE 2
CÔTE D'IVOIRE AND TOGO: STRUCTURE OF THE MINERAL INDUSTRIES IN 2013

(Metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
CÔTE D'IVOIRE				
Cement		Société des Ciments d'Abidjan (Amida Group)	Abidjan plant	750,000.
Do.		Société des Ciments du Sud-Ouest	San Pedro	100,000.
Do.		Société de Ciments et Materiaux (Holcim Ltd.)	Abidjan plant	1,200,000.
Do.		Ciments d'Afrique (CIMAF)	Youpougon industrial zone, 15 kilometers east of Abidjan	500,000.
Gold	kilograms	Agbaou Gold Operations S.A. (Endeavour Mining Corp., 85%, and Government, 15%)	Agbaou Mine, 200 kilometers northwest of Abidjan	3,000.
Do.	do.	LGL Mines CI SA (Newcrest Mining Ltd., 89.9%; Government, 10%; minority shareholder, 0.1%)	Bonikro Mine, 240 kilometers northwest of Abidjan	5,000.
Do.	do.	Société des Mines d'Ity [La Mancha Resources Inc., 45.9%; Société pour le Développement Minier (SODEMI), 44.1%; Government, 10%]	Ity Mine, 480 kilometers northwest of Abidjan	1,900.
Do.	do.	Société des Mines de Tongon SA (Randgold Resources Ltd., 89%; Government, 10%; local Ivorian company, 1%)	Tongon Mine, northern Côte d'Ivoire, 55 kilometers south of the border with Mali	9,000.
Do.	do.	Yaoure Mining SA (Amara Mining plc, 90%, and Government, 10%)	Yaoure Mine, 40 kilometers northwest of Yamoussoukro	1,240.[1]
Manganese		Compagnie Minière du Littoral [Société pour le Développement Minier de la Côte d'Ivoire (SODEMI), 51%; China National Geological and Mining Corp., 39%; private interests, 10%]	Lauzoua/Mokta Mine, 180 kilometers west of Abidjan	300,000.
Do.		Dharni Sampda Private Ltd.	Bondoukou Mine	NA.
Petroleum, crude	thousand 42-gallon barrels	Canadian Natural Resources Ltd., 57.61%; Svenska Petroleum Exploration AS, 27.39%; Société Nationale d'Operations Pétrolières de la Côte d'Ivoire (Petroci), 15%	Baobab oilfield, offshore	17,520.
Do.	do.	Canadian Natural Resources Ltd., 58.67%; Tullow Oil plc, 21.33%; Société Nationale d'Operations Pétrolières de la Côte d'Ivoire (Petroci), 20%	East Espoir oilfield, offshore	6,700.
Do.	do.	Tullow Oil plc., 45%; Anadarko Petroleum Corp., 40%; Société Nationale d'Operations Pétrolières de la Côte d'Ivoire (Petroci), 15%	Block CI-103	NA.
Do.	do.	Lukoil Overseas Côte d'Ivoire Ltd., 56.66%; Vanco Côte d'Ivoire Ltd., 28.34%; Société Nationale d'Operations Pétrolières de la Côte d'Ivoire (Petroci), 15%	Block CI-401	NA.
Petroleum products	do.	Société Ivorienne de Raffinage (Government, 100%)	Abidjan	27,000.
TOGO				
Cement		Société de Ciments du Togo S.A. (CIMTOGO) (Heidelberg Cement AG, 93.59%)	Grinding plant in Lome	700,000.
Do.		West Africa Cement S.A. (WACEM)	Tabligbo, 80 kilometers northeast of Lome	400,000 cement; 1,200,000 clinker.
Do.		Fortia Cement S.A. (Diamond Cement)	do.	600,000.
Gold	kilograms	WAFEX (Togolese private interests)	NA	10,400.
Do.	do.	SOLTRANS (Togolese private interests)	NA	6,000.
Iron ore		MM Mining S.A. (Togolese private interests)	Bangeli, Kara region	53,000.
Limestone		Ciments de l'Afrique de l'Ouest	do.	2,400,000.
Phosphate rock		Société Nouvelle des Phosphates du Togo	Akoumape and Hahotue	2,000,000.

Do., do. Ditto. NA Not available.

[1]On care-and-maintenance status.

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The Mineral Industry of Djibouti

By Thomas R. Yager

In 2013, the East African country of Djibouti produced basalt, brick clay, cement, salt, sand and gravel, and dimension stone (table 1). Djibouti's production and consumption of minerals were not globally significant.

Production

In 2013, salt production decreased by an estimated 88%. Cement production started in 2013. Data on the production of other minerals were not available (table 1).

Structure of the Mineral Industry

The cement plant at Ali Sabieh was Government owned, and the plant at Balbala was privately owned. Salt production at Lake Assal was carried out by artisanal miners. Crushed basalt, brick clay, and dimension stone were produced near the capital. Sand and gravel were produced from dry stream and river beds around the country (table 2).

Commodity Review

Metals

Gold.—In 2013, Stratex International plc of the United Kingdom and Thani Ashanti Alliance Ltd. [a joint venture of AngloGold Ashanti Ltd. of South Africa (50%) and Thani Dubai Mining Ltd. of the United Arab Emirates (50%)] explored for gold at the Oklila prospect, which is part of the Afar project. Stratex and Thani Ashanti planned to start a drilling program at the Pandora epithermal vein system in Oklila pending regulatory approval in the second half of 2014 (Stratex International plc, 2014, p. 5–6, 12).

Industrial Minerals

Cement.—In February 2013, Cimenterie d'Ali Sabieh opened a new cement plant with a capacity of about 240,000 metric tons per year (t/yr) at Ali Sabieh. The company started production at about one-third of capacity; output was likely to reach full capacity by mid-2014. Cement from the new plant was expected to be used domestically in new railways and a water pipeline. In March, Nael Cement Products of the United Arab Emirates opened a new plant at Balbala, which reportedly produced at one-half of its capacity of 220,000 t/yr (Edwards, 2013; International Cement Review, 2013; Emily Stoll, Economics Officer, U.S. Embassy, Djibouti, Djibouti, written commun., April 29, 2014, and May 5, 2014).

In 2012 (the most recent year for which data were available), Djibouti's cement consumption was estimated to be about 115,000 metric tons (t) compared with 100,000 t in 2011. Housing accounted for about 50% of domestic cement demand; infrastructure, 25%; public works, 15%; and industry, 10% (International Cement Review, 2013).

Salt.—Until 2010, artisanal miners produced about 12,000 t/yr of salt at Lake Assal. Production was less than 10% of the levels reached in 2000 when 15 companies mined salt. Nomads produced salt to trade with Ethiopian farmers for crops and livestock. By the end of 2013, salt mining had nearly ceased because of the discovery of salt deposits in the Afar region of Ethiopia (Banque Centrale de Djibouti, undated, p. 21; Ria Novosti, 2010; Emily Stoll, Economics Officer, U.S. Embassy, Djibouti, Djibouti, written commun., April 29, 2014).

As of the end of 2013, Djibouti reportedly had no larger scale salt producers. Previous attempts to start large-scale mining were suspended because magnesium and other contaminants rendered salt from Lake Assal unsuitable for the chemicals, glass, and plastic industries without additional processing (U.S. Embassy, Djibouti, Djibouti, 2011; Emily Stoll, Economics Officer, U.S. Embassy, Djibouti, Djibouti, written commun., April 29, 2014).

Mineral Fuels

Petroleum.—As of the end of 2013, Djibouti was not a producer of crude or refined petroleum and relied on imported petroleum products. Électricité de Djibouti, which was the Government-owned utility, consumed imported diesel and fuel oil in its power stations. The Government planned to produce 100% of Djibouti's power requirements from renewable sources by 2020. In October, the Government signed an agreement with the World Bank to assess geothermal resources in Fiale Caldera near Lake Assal (World Bank Group, 2013).

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TABLE 1
DJIBOUTI: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons)

Commodity[2]	2009	2010	2011	2012	2013[e]
Cement	--	--	--	--	150,000
Salt[e]	12,000	12,000	8,000 [r]	4,000 [r]	500

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. -- Zero.

[1]Table includes data available through May 14, 2014.

[2]In addition to the commodities listed, basalt, brick clay, sand and gravel, and dimension stone are produced, but available information is inadequate to make reliable estimates of output.

TABLE 2
DJIBOUTI: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	Cimenterie d'Ali Sabieh (Government owned)	Plant at Ali Sabieh	240,000
Do.	Nael Cement Products (subsidiary of Nael General Contracting Establishment)	Plant at Balbala	220,000
Salt	Artisanal miners	Mines at Lake Assal	12,000 [e]

[e]Estimated. Do. Ditto.

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The Mineral Industry of Egypt

By Mowafa Taib

In 2013, Egypt was Africa's second-ranked producer of natural gas after Algeria and the fifth-ranked producer of crude oil after Nigeria, Angola, Algeria, and Libya. Egypt was also Africa's second-ranked crude steel producer after South Africa and the world's eighth-ranked producer of direct-reduced iron (DRI). Furthermore, the country was an important producer of cement, nitrogen fertilizer, and phosphate rock. Metal and mineral-based commodities produced by companies in Egypt included aluminum, secondary copper, ferroalloys, gold, DRI, iron ore, manganese, crude steel, and tin. Egypt also produced such industrial minerals as barite, basalt, bentonite, dolomite, feldspar, fluorspar, granite, gypsum, ilmenite, kaolin, limestone, marble, quartz, salt, sand and gravel, sandstone, silica sand, soda ash, sulfur, and talc. Egypt's production of fuel minerals included coal, crude oil and condensate, natural gas, and refined petroleum products (table 1; BP p.l.c., 2014, p. 8, 22; Midrex Technologies, Inc., 2014, p. 7).

The Egyptian Mineral Resources Authority (EMRA) estimated the country's major mineral resources to include 5.0 billion metric tons (Gt) of silica sand, 1.25 Gt of phosphate rock, 1.0 Gt of feldspar, 900 million metric tons (Mt) of iron ore, 224 Mt of heavy metals, and 150 Mt of bentonite. The EMRA also reported the presence of large quantities of such quarrying resources as limestone (586 Gt), clay (200 Gt), dimension stone (4.2 Gt), dolomite (1.2 Gt), and gypsum (1.0 Gt) (Egyptian Mineral Resources Authority, 2014).

Minerals in the National Economy

In 2013, the Egyptian economy grew in real terms at a rate of 2.1% compared with 2.2% in 2012 and 5.1% in 2010. The sluggish growth in 2011–13 was because of weak performance in virtually all economic sectors following the January 25 Revolution in 2011 and continued political instability in the country. In 2013, the share of the mining sector, which included crude oil, natural gas, and other extracted minerals, in the Egyptian economy was 16.5% of the gross domestic product (GDP); the manufacturing sector, which included the aluminum, cement, fertilizer, and iron and steel industries, accounted for 15.8% of the GDP; and the construction sector accounted for 4.6% of the GDP. The mineral sector, including the extraction of hydrocarbons, contracted at a rate of 0.2% in 2012 whereas the manufacturing and construction sectors' rates of growth were 2.4% and 4.5%, respectively (Central Bank of Egypt, 2014, p. 124; MEED, 2015).

In 2013, the flow of foreign direct investment (FDI) into Egypt decreased by 19% to about $5.6 billion from about $6.9 billion (revised) in 2012. FDI inflows fluctuated sharply in recent years, ranging from $9.5 billion in 2008 to $483 million in 2011. The sharp change was attributed to the political unrest that had taken place in Egypt as a result of the Arab Spring. Most of the FDI flows to Egypt in 2013 went to unspecified greenfield projects and to the petroleum sector. The flows of FDI out of Egypt increased by about 43% to $301 million in 2013 compared with $211 million in 2012. The increase in FDI outflows in 2013 reversed the decrease in FDI outflows in both 2012 and 2011 (United Nations Conference on Trade and Development, 2014, p. 205, 218).

Government Policies and Programs

In early 2013, the Government increased energy prices for industries, powerplants, and households to reduce the budget deficit, which amounted to $26 billion in 2012, and to enable Egyptian General Petroleum Corp. (EGPC) to make debt payments to international crude oil and natural gas operators. In December, EGPC paid $1.5 billion of the $6 billion it owed to international oil companies. The EGPC debt, which amounted to $7.5 billion in July 2014, led most international oil and gas operators to delay spending on existing and planned oil and gas projects in Egypt (U.S. Energy Information Administration, 2014).

A draft of the new mining law, which was prepared by the EMRA with the help of the International Finance Corp. of the World Bank Group in 2008, was still awaiting parliamentary and presidential approval as of yearend 2013. The new law was intended to address problems associated with the current mining law, which is based on law No. 66 of 1953 and law No. 86 of 1956, which had been amended only twice (in 1957 and 1964). Investment law No. 8 of 1997 provided the legal framework for several mining companies that were established in the country in the early 2000s. The proposed law protects investments in the country against nationalization of both foreign and domestic companies and provides incentives for investing in mining and in the manufacturing of fertilizer and petrochemicals in the country's free trade zones (Egyptian Mineral Resources Authority, 2013).

Production

Notable increases in mineral commodity outputs in 2013 compared with those of 2012 included gold (36%), DRI (12%), steel rod (10%), sulfuric acid (9%), and urea (8%). Mineral commodities with notable decreases in production in 2013 compared with that of 2012 included refined petroleum products (by about 17%), ammonia (9%), and gross natural gas (8%) (table 1).

Structure of the Mineral Industry

The structure of the mineral industry of Egypt was mixed in terms of ownership. It included private, public, and state-owned companies. International mining and hydrocarbon companies formed joint ventures with local public and state-owned companies. Egypt's metals, industrial minerals, and mineral fuel industries were managed mainly by the Ministry of Petroleum. The individual Governorates and the Egyptian Armed Forces,

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however, also have some control over the country's mineral resources. The Ministry of Petroleum has five independently managed entities—EGPC, Egyptian Natural Gas Holding Co. (EGAS), Egyptian Petrochemical Holdings Co. (ECHEM), the EMRA, and Ganoube El Wadi Holding Co. (Ganope). The EMRA was responsible for conducting geologic mapping and mineral exploration and for issuing mining permits; it held shares in three mining companies—El Wadi Al Gadid Company for Mineral Resources and Oil Shale (Wadico), Egyptian Company for Mineral Resources (ECMR), and Shalateen Mineral Resources Co. The mineral development strategy of the EMRA is based on exploiting 60% of the country's mineral reserves within the next 30 years and leaving the remaining 40% untouched (table 2; Egyptian Company for Mineral Resources, 2014; Egyptian Mineral Resources Authority, 2014).

The Holding Company for Metallurgical Industries (HCMI) was an Egyptian joint-stock holding company organized to operate under the provisions of the public enterprise law. It had several affiliates that included Aluminium Co. of Egypt (Egyptalum), Delta Steel Mill Co., Egyptian Co. for Metallic Construction, Egyptian Copper Works Co., Egyptian Ferroalloys Co., Egyptian Iron and Steel Co. (Hadisolb), El Nasr Coke and Chemicals Co., El Nasr Forging Co., El Nasr Mining Co., El Nasr Pipes and Fittings Co., and General Co. for Ceramics and Porcelain. El Nasr Mining produced several mineral commodities, including ball clay, barite, clay, feldspar, fluorspar, gypsum, ilmenite, iron ore (mainly in the form of iron oxides), kaolin, magnesite, manganese, phosphate rock, quartz, and talc. The company exported mineral commodities from three export ports at Abu Ghusun, Hamrawein, and Safaga on the Red Sea (table 2; El Nasr Mining Co., 2014; Holding Company for Metallurgical Industries, 2014).

Mineral Trade

In 2013, the value of Egypt's total exports decreased for a second year to $28.8 billion from $29.4 billion in 2012 and $31.6 billion in 2011. The value of crude oil, natural gas, and petroleum products exports increased by 7% to $12.0 billion in fiscal year 2012–13 (which runs from July 1 to June 30) from $11.2 billion in fiscal year 2011–12. Crude oil exports increased by 25.3% to $6.5 billion from $5.2 billion, natural gas exports decreased by 20% to $1.6 billion from $2.0 billion, and refined petroleum products decreased by 2.5% to $3.9 billion from $4.0 billion during the same period. The volume of crude oil and condensate exports was 189,000 barrels per day (bbl/d) in 2013. The volume of liquefied natural gas (LNG) exports decreased by 44% to 3.8 billion cubic meters in 2013 from 6.8 billion cubic meters in 2012, extending the 30% decrease from the 9.7 billion cubic meters exported in 2011. Of Egypt's petroleum exports, 56% went to countries of the European Union; 28%, to India; and 13%, to China. The combined value of exports of chemicals, nitrogen fertilizer, phosphate-based fertilizers, and phosphate rock decreased to about $1.08 billion from $1.82 billion in 2012 and $1.36 billion in 2011; gold exports decreased to $901 million from $1,319 million in 2012 and $1,715 million in 2011; and exports of flat and rolled steel increased to $341 million from $324 million in 2012. Italy was the leading recipient of Egypt's exports followed by India, the United States, Saudi Arabia, Turkey, France, Spain, and Japan (Central Bank of Egypt, 2014, p. 93; United Nations Statistics Division, 2014; U.S. Energy Information Administration, 2014).

In 2013, Egypt's imports decreased by 4.6% to $66.7 billion from $69.9 billion in 2012. The value of petroleum products imports increased by 5.9% to $12.5 billion in 2012–13 from $11.8 billion in 2011–12; the volume of refined petroleum products imports averaged about 170,000 bbl/d in 2013. The value of semifinished iron and steel products imports decreased to $1.5 billion from $1.6 billion in 2012, and that of other iron and steel products imports increased to $1.135 billion from $1.109 billion in 2012. The volume of exports of finished and semifinished steel products increased to 359,000 metric tons (t) from 271,000 t in 2012, and the volume of imports increased to 4.2 Mt from 3.6 Mt in 2012. Steel ingots and semifinished steel imports increased in tonnage to 2.6 Mt from 1.6 Mt in 2012. Egypt imported 3.8 Mt of iron ore in 2013 and 2.9 Mt of scrap compared with 4.2 Mt and 2.0 Mt, respectively, in 2012 (United Nations Statistics Division, 2014; U.S. Energy Information Administration, 2014; World Steel Association, 2014).

Total mineral exports by HCMI's affiliated companies decreased by 21% to 3.0 Mt in 2012–13 from about 3.8 Mt in 2011–13. The value of mineral exports by HCMI's affiliated companies also decreased by 22% to $725 million in 2012–13 from $931 million in 2011–12. These exports included 183,000 t of aluminum products, produced by Egyptalum and valued at $428 million; 23,600 t of ferroalloys, produced by Egyptian Ferroalloys and valued at $40.2 million; 50,000 t of iron and steel products, produced by Hadisolb and valued at $32 million; 44,000 t of aluminum and copper products, produced by Egyptian Copper Works Co. and valued at $14.8 million, and 23,600 t of coke, produced by El Nasr Coke and valued at $10.2 million. Total exports by El Nasr Mining Co. amounted to about 2.7 Mt and were valued at $187 million, including 2.6 Mt of phosphate rock valued at $185 million, 17,200 t of ilmenite valued at $1.0 million, and 9,600 t of talc valued at $1.1 million (Holding Company for Metallurgical Industries, 2014).

Egyptian exports to the United States decreased sharply by 47% to $1.6 billion in 2013 from $3.0 billion in 2012. The main exports were, in order of value, oil products, gold, crude oil, and fertilizers. Egypt's imports from the United States deceased by about 6% to $5.2 billion from $5.5 billion in 2012. The major imports were, in order of value, wheat, oil products, cranes and bulldozers, and pumps and fans (U.S. Census Bureau, 2014).

Commodity Review

Metals

Gold.—In 2013, the 50–50 joint venture Sukari Gold Mine Co., which operated the Sukari gold mine, was owned by Centamin plc of the United Kingdom and ECMR. The company mined 11.7 Mt of ore, processed 5.7 Mt of ore, and produced 11,102 kilograms (kg) (reported as 356,943 troy ounces) of gold compared with 6.4 Mt of ore mined, 4.5 Mt of ore processed, and 8,175 kg (reported as 262,828 troy ounces) of gold produced in 2012. The Sukari gold mine is located about 23 kilometers (km) southwest of Marsa Alam in Egypt's eastern desert and was the first modern large-scale

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operating gold mine in Egypt. The Sukari gold mine began production as an open pit mine and was extended underground in 2011. As of September 30, 2013, the combined open pit and underground mineral reserves of the Sukari gold mine were estimated to be 255 t (8.2 million troy ounces) of gold, which was a 19% decrease in total open pit and underground reserves of 314 t (10.1 million troy ounces) since December 31, 2011. The decrease in reserves was attributed to the depletion of the mine. The cost of the international price for fuel exceeded the expected Government-subsidized fuel price, which resulted in higher mining and processing costs that made the operation noneconomic. Centamin projected a 20-year mine life (Centamin plc, 2014a, p. 5, 18; b).

In 2012, the Egyptian Administrative Court ruled that Centamin's contract with ECMR to produce gold from the Sukari gold mine was invalid and cancelled Centamin's 30-year mine exploitation contract with the Government. Centamin appealed the court ruling to the Supreme Administrative Court and applied to suspend the enforcement of the decision during the appeal process. In March, the Supreme Administrative Court approved Centamin's request and allowed the continuation of operations at the Sukari gold mine during the appeal period. Centamin expected the legal dispute to be resolved by yearend 2014 (Centamin plc, 2013, p. 4; Rebelo, 2014).

The Hamash gold mine, which is located 100 km west of Marsa Alam in southeastern Egypt, remained closed in 2013. The mine had produced 465 kg of gold in 2010 and 60 kg of gold in 2009 and was operated by Hamash Misr for Gold Mines, which was a 50–50 joint venture between Matz Holding Limited Co. of Cyprus and ECMR. Hamash Misr was also involved with the Abu Tarda gold mine and the Um Eliga gold mine (Hamash Misr for Gold Mines, 2014).

Iron and Steel.—Egypt's production of continuously cast steel increased by 2% to 6.75 Mt in 2013 from 6.63 Mt in 2012. Most of the steel production (92%) was carried out by electric arc furnaces, and the remaining (8%) was produced by oxygen-blown converters. Production of hot-rolled steel increased to 7.4 Mt compared with about 7.3 Mt in 2012; of this amount, 85% was long products, and 15% was flat products. Al Ezz Steel Rebars S.A. (Ezzsteel)—which owned a majority stake in Al Ezz Dekheila Steel Co., Al Ezz Flat Steel Co., and Al Ezz Rolling Mills, S.A.E.—continued to be the leading steel producer in Egypt and North Africa and had a total capacity of 5.8 million metric tons per year (Mt/yr) of steel products. Ezzsteel had four steel plants in Egypt—the Alexandria plant, which had the capacity to produce 3.0 Mt/yr of flat, reinforcing-steel bar (rebar), and steel wire; the Suez plant, which had been completed in 2011 and had the capacity to produce 1.3 Mt/yr of flat steel; the Sadat City plant, which produced 1.0 Mt/yr of rebar; and the Tenth of Ramadan City plant, which produced 0.5 Mt/yr of rebar and steel wire (Al Ezz Steel Rebars S.A., 2014).

Suez Steel Co. (Solb Misr, also known as Hadidna) was the second largest steel company in Egypt in terms of production capacity, which was 2 Mt/yr of crude steel and 1.5 Mt/yr of finished steel products. The company produced billets, DRI, rebar, and wire rods and coils (Suez Steel Co., 2014).

Egyptian Steel Group, which depended on billet from the local market and on imports to feed its 300,000-metric-ton-per-year (t/yr) rebar mill in Port Said, was planning an initial public offering in 2015. The group operated a second mill that produced 250,000 t/yr of steel wire in Alexandria. Egyptian Steel was seeking $573 million to finance the construction of steel mills in Ain Al-Sokhna and Beni Suef, which would add 1.7 Mt/yr of rebar and 1 Mt/yr of billet to the company's production capacity by 2015. The company was building two electric arc furnace plants that would be fed with scrap and would each have the capacity to produce 850,000 t/yr of billet. The plants were expected to be completed by 2017 (Egyptian Steel Group, 2014).

Tantalum and Tin.—In February, a group of four Egyptian banks—Bank Audi, Banque du Caire, Banque Misr, and Commercial International Bank—agreed to finance the Abu Dabbab tantalum, tin, and feldspar project. In July, Banque du Caire dropped out of the consortium; the remaining three banks agreed to continue financing the project without replacing Banque du Caire. The Abu Dabbab tantalum, tin, and feldspar project was owned and operated by Tantalum Egypt J.S.C., which was a 50–50 joint venture of ECMR and Tantalum International Pty Ltd. (a wholly owned subsidiary of Gippsland Ltd. of Australia). The combined measured, indicated, and inferred resources of the Abu Dabbab deposit were estimated to be 44.5 Mt grading 250 grams per metric ton (g/t) tantalum pentoxide (Ta_2O_5) and 0.09% tin at a cutoff grade of 100 g/t Ta_2O_5. The indicated mineral resources were estimated to be 17.3 Mt grading 250 g/t Ta_2O_5 and 0.078% tin, and the inferred mineral resources were estimated to be 12 Mt grading 200 g/t Ta_2O_5 and 0.03% tin (Gippsland Ltd., 2014a).

Based on a bankable feasibility study for the Abu Dabbab project that was completed in 2011, Tantalum Egypt planned to produce 420,000 kilograms per year (kg/yr) (925,000 pounds per year) of high-purity tantalum synthetic concentrate, known as SynCon (a tantalum concentrate that contains 55% Ta_2O_5) and 2,300 t/yr of tin in concentrate in phase 1 of the project. In phase 2, the company expected to produce up to 2.4 Mt/yr of feldspar (Gippsland Ltd., 2013).

Gippsland continued alluvial tin production in 2013 at Abu Dabbab, which had started in March 2012. The company produced 111 t of tin contained in concentrate in 2013 compared with 100 t in 2012 (table 1; Gippsland Ltd., 2014b).

Industrial Minerals

Cement.—In 2013, cement production in Egypt decreased by 9% to about 50 Mt from 55.2 Mt in 2012. The decrease in production was attributed to the increase in the cost of fuel and to shortages in supply. The country had 18 producers of cement and clinker with capacities of 65 Mt/yr and 61.8 Mt/yr, respectively (table 2; Arab Union of Cement and Building Materials, 2013).

In September, construction of the greenfield cement plant by ASEC Minya Cement Co., which was located 200 km south of Cairo in the Governorate of Al Minya, was completed. Production at the 1.5-Mt/yr-clinker-capacity plant and at the 2.0-Mt/yr-cement-capacity plant began in June. The plant was owned by ASEC Cement Co. S.A.E. (45.1% interest), Safari Investments (30.7%), Misr Qena Cement Co. (13.9%), Denmark's Investment Fund for Developing Countries (9.2%),

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and others (1.1%). ASEC Cement also owned a 27.55% stake in Misr Qena Cement Co., which operated a cement plant located at El Quseir in the Governorate of Qina. The plant had been producing about 2 Mt of cement annually since 2010 (ASEC Cement Co. S.A.E., 2014, p. 3).

Nitrogen.—Nine companies produced a combined total of 3.2 Mt of ammonia (2.7 Mt of nitrogen content) in Egypt in 2013, which was 9% less than that of 2012. The top producers of ammonia included Abu Qir Fertilizer and Chemical Industries Co., which was responsible for about 31% of the country's total production; Egyptian Fertilizers Co., which produced 12% of Egypt's ammonia output; and Alexandria Fertilizer Co. (Alexfert), Helwan Fertilizer Co., and Misr Fertilizer Production Co. S.A.E. (MOPCO, each of which produced 11% of the total output. Other producers included Egyptian Chemical Industries-KIMA, El Delta Company for Fertilizers and Chemical Industries (ASMEDA), El Nasr Fertilizers and Chemicals Co. (SEMADCO), and Egyptian Basic Industries Corp. (EBIC), which accounted for 16%. Six companies produced 3.9 Mt of urea (1.8 Mt of urea-nitrogen content) in 2013, which was 5% more than that of 2012. Abu Qir Fertilizer and Chemical Industries Co. was the leading producer of urea and accounted for 20% of the country's total production, followed by Egyptian Fertilizers Co. (19%), Helwan Fertilizer Co. and MOPCO (15% each), Alexfert (14%), and El Delta Co. (11%) (Arab Fertilizer Association, 2014, p. 27, 32).

In 2013, MOPCO was building two additional urea trains at the Rehab Industrial Free Zone to triple its urea production capacity to 1.95 Mt/yr from 650,000 t/yr. MOPCO's wholly owned subsidiary Egyptian Nitrogen Products Company S.A.E. obtained a $1.05 billion loan from a consortium of local banks to finance the expansion plan. Agrium Inc. of Canada, which held 26% interest in MOPCO, was expected to receive 507,000 t/yr of urea output and 39,000 t/yr of ammonia in lieu of its investment after the expansion work is completed. Most of Agrium's share of the output would be sold through a subsidiary of Agrium Europe (Agrium Inc., 2011, p. 3).

Orascom Construction Industries S.A.E. (OCI) of Egypt and the Netherlands produced ammonia, granulated urea, and other nitrate fertilizers at its plants in Egypt. OCI had a majority ownership in two nitrogen fertilizer plants at Ain Al-Sokhna near the city of Suez through its subsidiaries EBIC and Egyptian Fertilizers Co. (EFC). The EBIC plant at Ain Al-Sokhna was 60% owned by OCI and had the capacity to produce 0.7 Mt/yr of anhydrous ammonia. The plant had a dedicated 8-km pipeline from the plant to a refrigerated bulk liquid export jetty on the Suez Canal. EFC's plant, which was wholly owned by OCI, completed a debottlenecking project that increased the production capacity to 1.6 Mt/yr of urea from 1.3 Mt/yr (Orascom Construction Industries S.A.E., 2014).

Phosphate Rock.—In 2013, the gross weight of phosphate rock produced in Egypt amounted to 5.9 Mt, which was a decrease of 5% compared with that of 2012. About 70% of Egypt's total phosphate rock production was carried out by El Nasr Mining. The company produced about 4.1 Mt of phosphate rock from the East El Sebaáya Mine, the West El Sebaáya Mine, and the Red Sea Mine at El Quseir. El Nasr Mining owned two export facilities at ports on the Red Sea: the Port of Hamrawein, which had the capacity to load vessels of up to 40,000 t, and the Port of Abu Ghusun, which had the capacity to load vessels of up to 10,000 t (Arab Fertilizer Association, 2014, p. 37; El Nasr Mining Co., 2014).

Phosphate Misr Co. S.A.E. (PMC), which was the country's second-ranked producer of phosphate rock, produced about 1.9 Mt of phosphate rock (about 32% of the country's total production) compared with 1.7 Mt in 2012. PMC operated the New Valley phosphate rock mines, which are located on the Abu Tartur plateau, at equal distance (650 km) from Cairo and the Port of Safaga on the Red Sea. At yearend 2013, PMC had the capacity to produce 2.5 Mt/yr of phosphate rock (Arab Fertilizer Association, 2014, p. 41; Phosphate Misr Co., 2014).

Mineral Fuels

Natural Gas.—Egypt produced 56.1 billion cubic meters of gross natural gas in 2013, which was about a 7.9% decrease from the 60.9 billion cubic meters produced in 2012 and about an 8.6% decrease from the 61.4 billion cubic meters produced in 2011. The country's proved natural gas reserves at the end of 2013 were estimated to be 1.8 trillion cubic meters and accounted for 1% of the world's total natural gas reserves. Egypt has been responsible for 1.7% of the world's total natural gas production in recent years. Most of Egypt's natural gas production came from Mediterranean Sea blocks where the majority of the country's gas reserves are located. The remaining reserves are located in the Western Desert, the Gulf of Suez, and the Nile Delta. Several natural gas discoveries have been reported in Egypt annually since 2008 (BP p.l.c., 2014, p. 20, 22; U.S. Energy Information Administration, 2014).

Dana Gas PJSC of the United Arab Emirates held three 100% operator licenses in three concessions (El Manzala, West El Manzala, and West El Qantara) and produced natural gas from 13 fields in the Nile Delta in 2013. Dana Gas was also a 50% operator partner in a producing field (Komombo) in upper Egypt. In 2013, the company produced 1.8 billion cubic meters of natural gas and 2.7 million barrels (Mbbl) of petroleum liquids. The company also held a 26.4% interest in the Nile Delta Block. Egyptian Bahrain Gas Derivatives Co.'s natural gas liquids extraction plant in Ras Shukheir, which was owned by Dana Gas, remained stable and was not affected by the civil unrest in Egypt. The plant had the capacity to produce 130,000 t/yr of liquefied petroleum gas (LPG). Dana Gas has been ramping up its capital expenditure in Egypt despite the turmoil as the Government tried to encourage natural gas companies to increase output by promising them faster debt repayments (Dana Gas PJSC, 2014, p. 9, 19).

RWE Dea Egypt, a subsidiary of RWE Dea A.G. of Germany, produced its first gas from Egypt's Disouq concession, which is located in the Nile Delta in the Kafr ash Shaykh Governorate. The concession comprises seven natural gas fields in the area and produces a total of 11.4 billion cubic meters of natural gas. The natural gas from the Disouq concession was delivered to the Egyptian national grid. Production is expected to increase gradually during the commissioning period to about 1.4 million cubic meters per day of natural gas. A peak production level of between 4.0 and 4.5 million cubic meters per day is expected to

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be attained in 2014 when the installation of an additional central treatment plant is completed (Petroleum Africa, 2013c).

In July, BP Egypt, a subsidiary of BP p.l.c. of the United Kingdom, announced a significant gas discovery in the East Nile Delta. The deepwater exploration well, called Salamat, was the deepest well ever drilled in the Nile Delta. Salamat was the first well in the North Damietta offshore concession awarded in 2010. BP Egypt had 100% equity in the concession, which is located about 75 km north of Damietta City and 35 km northwest of the Temsah offshore facilities (BP p.l.c., 2013).

In July, BG Group p.l.c. of the United Kingdom announced that delays at its projects in Egypt would reduce the company's 2014 production by about 30,000 barrels of oil equivalent per day, equivalent to about 5% of 2013 output. BG Group attributed part of the expected downgrade in production to ongoing political and social instability in Egypt. BG Group depended on its operations in Egypt for about one-fifth of the company's output, which provides a source of revenue for its new projects in Australia and Brazil. Because of political unrest in Egypt in 2013 and because BG was owed $1.3 billion by Egypt for domestic gas sales, the company was increasingly anxious about future investment in the country (Callus, 2013).

In 2013, Sea Dragon Energy Inc. of Canada was active in oil and gas exploration in four concessions in Egypt—NW Gemsa and Shikhier Marine in the Eastern Desert, South Disouq in the Nile Delta, and South Ramadan in the Gulf of Suez. In April, the company was awarded the South Disouq concession in the Nile Delta. The South Disouq concession is on trend with the prolific Abu Madi accumulations to the north, which contain both the giant Abu Madi gasfield, with more than 85 billion cubic meters of natural gas, and the offshore Mediterranean Baltim fields. This block is also in the same area of the Nile Delta where Sea Dragon discovered the large El Wastani field with more than 14 billion cubic meters of natural gas. The concession's areal extent is large at 1,275 square kilometers (km^2), and the concession is estimated to have resources in excess of 42 billion cubic meters of natural gas. Once the awarded concession is approved by the Government, Sea Dragon intended to acquire 300 km^2 of three-dimensional (3–D) seismic survey data and to drill at least one exploratory well (Sea Dragon Energy Inc., 2014, p. 1, 8, 11–12).

In April, Union Fenosa Gas S.A. (UFG), which was a joint venture of Eni S.p.A. of Italy and Gas Natural of Spain, filed a complaint with an arbitration court over alleged nonpayment of bills by an Egyptian partner at an LNG plant in Egypt. UFG, which owned an 80% stake in the Damietta LNG plant, filed the complaint against EGAS with the International Chamber of Commerce's Court of Arbitration. EGAS and EGPC share the remaining stake (20%) in the LNG plant. The plant has stopped operating as Egypt held on to its natural gas supply for the domestic market as the economy continued to be weak amid political and social unrest in the wake of the Arab Spring (Rucinski, 2013).

Petroleum.—Fifty-five oil and gas discoveries were made in Egypt in 2013 compared with 86 in 2012; most of the discoveries in both years were oil discoveries. Egypt held 4.4 billion barrels of proved oil reserves. Egypt's petroleum production averaged about 715,000 bbl/d during the past 3 years, which was slightly less than the average production of 730,000 bbl/d in 2009. More than one-half of Egypt's crude oil production came from the Western Desert and the remainder came from the Eastern Desert, the Gulf of Suez, the Mediterranean Sea, the Nile Delta, upper Egypt (southern Egypt), and the Sinai Peninsula (BP p.l.c., 2014, p. 8; U.S. Energy Information Administration, 2014).

In December, EGPC and EGAS announced an international auction for 22 concessions for oil and gas exploration in accordance with production-sharing agreements. The concessions were for areas in the Suez Canal, the Mediterranean Sea, the Nile Delta, and the Western Desert. The auction was scheduled to end on May 19, 2014. The Government also approved seven new oil and gas exploration agreements with such companies as BP, Dana Gas, and Petroceltic International p.l.c. of Ireland, which could bring investments of at least $1.2 billion to the sector (Daily News Egypt, 2013).

In January, the Government approved a plan by Dana Petroleum Ltd. of the United Kingdom to develop its Nefertiti field in the Gulf of Suez following the completion of an appraisal well. Dana Petroleum, a subsidiary of state-owned Korea National Oil Corp., had a portfolio of 17 development leases in Egypt producing about 12,000 bbl/d of crude oil. Dana Petroleum, in partnership with Inpex Corp. of Japan, had drilled the Nefertiti-2X at the end of 2012. The well tested at a maximum stabilized flow rate of 1,850 bbl/d of crude oil, and the field began producing about 2,500 bbl/d of crude oil in July (Petroleum Africa, 2013b).

In February, Eni made a new oil discovery at its Rosa North 1X well located in the Meleiha concession in the Western Desert of Egypt. Part of Eni's strategy was to refocus its exploration activities in the country by targeting deeper oil plays in the Western Desert. The discovery well encountered a total oil column of about 75 meters (m) in multiple sandstone layers in the Alam El Bueib, Bahariya, Khatatba, and Ras Qattara reservoirs. Eni followed up on the discovery by drilling two more wells. Production for each well was estimated to be 2,000 bbl/d of crude oil. Production at the Rosa North Field was expected to increase to 5,000 bbl/d of crude oil during 2013 (Rigzone, 2013a).

In February, Petroceltic, which held a 40% working interest in the Mesaha basin concession, plugged and abandoned its Mesaha-1 exploration well in Egypt after the firm did not find hydrocarbon indicators there. Petroceltic operated mainly in the onshore Nile Delta of Egypt where it held a 100% operating interest in 12 producing fields and 13 development contracts in the El Mansoura region and the South East El Mansoura exploration concession. In 2013, the company boosted its exploration portfolio in Egypt by adding three new concessions. As a result, Petroceltic acquired a 37.5% interest in the El Qa'a Plain Block on the eastern shore of the Gulf of Suez. The company also held a 75% operating interest in the onshore South Idku concession in the Nile Delta and a 50% interest in the offshore North Thekah concession (Rigzone, 2013b; Petroceltic International plc, 2014).

BG Group endorsed the following phase of development for the offshore West Delta Deep Marine (WDDM) concession, which is located north of the Mediterranean coast of Egypt. The company's two major producing assets in Egypt were

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the WDDM and the Rosetta. Production at the Rosetta field was proceeding according to plan, whereas production at the WDDM was decreasing. The decrease in production in recent years was attributed to seawater encroachment into some oil wells (Petroleum Africa, 2013a).

In March, Sea Dragon Energy completed the Al Amir SE–14 ST2 well in the Rahmi sands and tested at 3,486 bbl/d of crude oil. The well was producing at a rate of 1,333 bbl/d of crude oil, resulting in an increase in the total gross crude oil production from the NW Gemsa concession of 11,420 bbl/d, including solution gas and natural gas liquids. The NW Gemsa concession is located onshore on the western side of the Gulf of Suez, about 300 km southeast of Cairo. Sea Dragon held a 10% working interest in the NW Gemsa concession with Vegas Oil and Gas S.A. of Greece, which held a 50% operating interest, and Circle Oil p.l.c. of Ireland, which held a 40% interest. In November, Sea Dragon Energy sold all the issued and outstanding shares of its indirect wholly owned subsidiary Sea Dragon Energy (Kom Ombo) Ltd. Sea Dragon Energy owned a 50% participating interest in the Kom Ombo concession, which is located about 1,000 km south of Cairo (Arabian Oil and Gas, 2013; Gulf Oil and Gas, 2013).

In June, Vegas Oil and Gas made an oil discovery at its Al Amir SE (AASE) field on the NW Gemsa concession. The AASE–17 well was drilled to a total depth of 2,972 m into the Upper Rudeis Formation and hit 3.6 m of net reservoir (sand intervals with useful reservoir properties) in the Kareem Shagar Sand and 4.8 m of net reservoir in the underlying Rahmi Sand. Concession partner Circle Oil reported that the well had been producing at an average rate of 3,665 bbl/d of crude oil and 0.4 million cubic meter per day of gas (Lewis, 2013).

In October, TransGlobe Energy Corp., which held exploration permits in the Eastern Desert and the Western Desert of Egypt, announced the ratification of four new production-sharing concessions (PSCs) into law by the Government. TransGlobe was awarded the four PSCs in the 2011–12 EGPC bidding round and held a 100% working interest in all four of them. Earlier in January, TransGlobe abandoned the Al Azayem 1 well on Egypt's South Mariut concession. The Al Azayem 1 well was the first of three wells planned by TransGlobe's South Mariut drilling program. The well was drilled to a depth of 4,917 m and was subsequently plugged and abandoned because no hydrocarbons were found in the primary reservoir. TransGlobe held 60% interest in the South Mariut concession (TransGlobe Energy Corp., 2013a, b).

In December, the Government signed a new exploration agreement with RWE Dea A.G. of Germany and Dove Energy Group Ltd. of the United Kingdom for petroleum and gas exploration to the east of Ras Badran in the Gulf of Suez. The agreement included the drilling of three new exploration wells in the exploration zone that covers 45.6 km^2. RWE Dea held a total of 10 onshore and offshore concessions in Egypt that cover an area of about 3,700 km^2 (American Chamber of Commerce in Egypt, 2013; RWE Dea A.G., 2014).

In 2013, Apache Corp. of the United States operated 1,072 oil and gas wells, which accounted for 19% of Egypt's crude oil and natural gas production and 10% of total proven reserves of crude oil and natural gas. In May, Apache reported three new discovery wells in the Western Desert of Egypt, which stretched the company's production base to the northeast of the North Ras Qattara concession and to the southwest in the Siwa concession. These discoveries included the NRQ 3151–1X, an Alamein basin discovery, which is located in the North Ras Qattara concession; the SIWA L–1X discovery, which is located in the Siwa concession in the Faghur Basin; and the NTRK–G–1X discovery, which is an exploratory well located in the North Tarek concession inside the Matruh basin. Apache held a 70% operator interest in the North Ras Qattara concession with IPR Group of the United States holding the remaining 30% (Apache Corp., 2013; 2014, p. 8).

In August, the company reported seven oil and gas discoveries in four geologic basins and six concessions south of the Mediterranean Sea in Egypt's onshore Western Desert. The largest discovery was the Riviera SW–1X discovery on the southern edge of the Abu Gharadig basin. It flowed 5,800 bbl/d of oil and 79 million cubic meters per day of natural gas from the Lower Bahariya sand. In November, Apache sold one-third of its Egyptian oil and gas business to state-owned China Petrochemical Corp. (Sinopec) for $2.95 billion after Apache's investors expressed concerns over its exposure in Egypt. The purchase was one of Sinopec's biggest investments in the Middle East and was expected to increase the company's annual production by about 9% (Apache Corp., 2014, p. 8, 20).

Refined Petroleum Products.—Egypt was the leading producer of refined petroleum products in Africa. The U.S. Energy Information Administration reported that the country's total installed refining capacity in 2013 was 704,000 bbl/d of crude oil at its eight petroleum refineries. The country's output of refined petroleum products decreased by 28% between 2009 and 2013. Therefore, the Government planned to increase its petroleum refining capacity by an additional 600,000 bbl/d by building two new refineries to meet the increased demand for refined petroleum products in the local market (U.S. Energy Information Administration, 2014).

Egyptian Refinery Co. (ERC) was a partnership company created to build a $3.7 billion hydrocracking and coking refinery in Mostorod, which is located about 10 km northeast of Cairo. The partners in ERC included state-owned Cairo Oil Refining Co. (CORC; 40%), G.S. Engineering and Construction Corp. of the Republic of Korea (30%), and Mitsui and Co. of Japan (30%). The new refinery would take 4 years to build and would be built next to the existing CORC refinery within the Mostorod Petroleum Complex. The new ERC refinery would have the capacity to produce 4.2 Mt/yr of refined petroleum products, including 2.3 Mt/yr of Euro V diesel (equivalent to 60% of Egypt's current diesel imports) and 600,000 t/yr of jet fuel in a more efficient manner while eliminating 93,000 t/yr of sulfur dioxide emissions. Refinery products from both the new refinery and the upgraded existing refineries would be purchased by EGPC and delivered to consumption points in Cairo. Qatar Petroleum International held a 27.9% interest in the new refinery project, EGPC held a 23.8% interest, the private equity company of Qalaa Holdings (formerly Citadel Group) had an 11.7% interest, and the remaining shares were held by 10 international finance and development institutions. Progress on the ERC refinery project and on another new, 130,000-bbl/d refinery at

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Ain Al-Sokhna was delayed during 2013 owing to political and civil unrest in the country (Egyptian Refining Co., 2014; Qalaa Holdings, 2014).

Outlook

Much of the country's economic development and growth depends on the performance of the new Government that was installed in Egypt in 2014 and on the Government's ability to supply sufficient electricity, natural gas, and other mineral fuels to cement, fertilizer, and steel plants and to other economic sectors. Many investors remain unconvinced that the steps taken by the Government will improve the business climate of the country; several court cases have challenged contracts and agreements signed with previous governments. With the exception of gold production, which is expected to increase by about 20% by 2015, mining output in Egypt is not expected to change significantly during the next 5 years. No date for tantalum production at the Abu Dabbab tantalum, tin, and feldspar project has been announced yet because Gippsland is updating its processing plant feasibility study to account for the additional cost stemming from increases in fuel prices. On December 8, 2014, the President of Egypt signed law No. 198, which became Egypt's new mining law.

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TABLE 1
EGYPT: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013 [e]
METALS						
Aluminum, metal:						
Primary		245 [r]	281 [r]	321 [r]	337 [r]	340
Secondary[e]		170	180	180	180	180
Total		415 [r]	461 [r]	501 [r]	517 [r]	520
Copper, refined, secondary[e]		111 [3]	3	126 [3]	3	3
Gold	kilograms	95	9,847	6,304	8,148	11,102
Iron and steel:						
Iron ore and concentrate, gross weight		1,780 [r]	1,400 [r]	1,500 [r]	3,000 [r]	3,000
Fe content (50%)		890 [r]	700 [r]	750 [r]	1,500 [r]	1,500
Metal:						
Pig iron		800	600	600	550	550 [3]
Direct-reduced iron		3,051	2,965	2,932	3,068	3,432 [3]
Steel, crude		5,500	6,700	6,486	6,627	6,754 [3]
Rolled, hot		6,352	7,939	6,588	7,265	7,438 [3]
Wire rod		915	865	970	1,113	1,219 [3]
Ferroalloys:[e]						
Ferromanganese		30	37	30	30	30
Ferrosilicon		47	26	52	78	78
Manganese ore:						
Gross weight		120 [e]	160	108	110	110
Mn content		40 [e]	37	36	40	40
Tin, concentrate	metric tons	--	--	--	100 [r]	111 [3]
INDUSTRIAL MINERALS						
Barite	metric tons	1,587 [r]	1,170 [r]	1,168 [r]	1,170 [r]	1,200
Cement, hydraulic, all types		46,900	44,592	43,884	55,200	50,000
Clays:						
Bentonite	metric tons	35,384 [r]	28,865 [r]	33,132 [r]	30,000 [r]	30,000
Kaolin	do.	523,300 [r]	304,200 [r]	300,000 [r]	300,000 [r]	300,000

See footnotes at end of table

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TABLE I—Continued
EGYPT: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013 [e]
INDUSTRIAL MINERALS—Continued						
Feldspar, crude	metric tons	178,000 [r]	405,600 [r]	210,000 [r]	400,000 [r]	400,000
Fluorspar	do.	4,343 [r]	5,953 [r]	3,808 [r]	4,000 [r]	4,000
Gypsum		1,035 [r]	2,000 [r]	2,138 [r]	2,200 [r]	2,200
Lime[e]		800	800	800	800	800
Nitrogen:[e]						
Ammonia, N content		1,790	3,000	3,500	2,924 [r,3]	2,655 [3]
Urea, N content		1,120	2,310 [3]	2,225 [3]	1,684 [3]	1,813 [3]
Phosphate:						
Phosphate rock		6,227	3,435	4,746	6,236	5,922 [3]
P_2O_5 content		1,868	1,030	1,400	1,835	1,777 [3]
Phosphoric acid		--	--	21	64	65 [3]
Quartz		34	54	35	35	35
Sodium compounds:						
Salt		2,703	2,460	2,884	2,809 [r]	2,850
Soda ash[e]		50	50	50	50	50
Soda, caustic[e]		150	150	158	165	165
Stone, sand and gravel:						
Basalt	thousand cubic meters	--	243	245	245	245
Dolomite		93	117	120	120	120
Granite, dimension stone	thousand cubic meters	59	480	480 [e]	480 [e]	480
Limestone [e]	do.	1,914 [3]	1,910	2,000	2,000	2,000
Marble blocks[e]	do.	284	1,400	1,400	1,400	1,400
Sand:[e]						
Industrial sand (glass sand)		410	401	400	400	400
Sand and gravel		266 [3]	910	900	900	900
Sandstone[e]		453 [3]	400	400	400	400
Sulfur:						
Elemental, byproduct		32	50 [r]	50 [r]	80 [r]	80
Sulfuric acid, S content[e]		220	184 [r,3]	287 [r,3]	360 [r]	392 [3]
Talc, soapstone, pyrophyllite [e]	metric tons	72,000 [r]	35,474 [r,3]	12,935 [r,3]	10,000 [r]	10,000
Titanium, ilmenite[e]	do.	48,400 [r,3]	6,050 [r,3]	-- [r]	-- [r]	20,000
Vermiculite	do.	4,650	-- [r,3]	2,865 [r]	3,000 [r]	3,000
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross production	million cubic meters	62,700 [r]	61,300 [r]	61,400 [r]	60,900 [r]	56,100 [3]
Dry	do.	47,205	46,215	46,540	45,000	45,000
Natural gas liquids	thousand 42-gallon barrels	57,670	57,962	39,785	35,077	35,077
Petroleum:						
Crude, including condensate	do.	266,450	264,625	260,610 [r]	260,975 [r]	260,610 [3]
Refinery products:						
Liquefied petroleum gas	do.	5,986	5,986	5,694	5,840	5,000
Gasoline	do.	29,164	28,698	24,054	28,580	26,000
Kerosene and jet fuel	do.	11,607	13,104	13,797	14,272	13,000
Distillate fuel oil	do.	62,233	62,926	56,648	54,130	50,000
Residual fuel oil	do.	61,393	59,386	59,605	61,210	55,000
Lubricants	do.	2,600	2,600	2,600	2,600	2,500
Asphalt[e]	do.	3,200	5,600	5,600	5,600	5,000
Other[e]	do.	44,569	38,072	34,249	22,578 [r]	5,925
Total	do.	220,752	216,372	202,247	194,810 [r]	162,425

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. -- Zero.

[1]Table includes data available through December 31, 2014.

[2]In addition to those listed, Egypt produced a number of commodities for which data were unavailable, including coal; gemstones; iron oxide pigments, mica; a number of metals, such as lead (which was produced from recycled material); zinc; and manufactured mineral commodities, such as carbon black and glass.

[3]Reported figure.

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TABLE 2
EGYPT: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	Aluminium Co. of Egypt (Egyptalum) (Government, 80%, and private interests, 20%)	Nag Hammadi	266.
Aluminum, secondary	Egyptian Copper Co. (Holding Company for Metallurgical Industries, 100%)	Alexandria	50.
Do.	Arab Aluminium Co. S.A.E.	Ismaelia	15.
Do.	Egyptian Aluminium Products Co. (Alumisr)	Cairo	12.
Do.	Egyptian Metal Works	do.	NA.
Do.	General Metals Co.	do.	6.
Do.	Helwan Company for Non-Ferrous Industries	Helwan	45.
Do.	Al Saad Aluminium Co.	Mostorod	10.
Do.	Al Qantara for Ferrous Metals Co.	Suez	25.
Barite	El-Nasr Mining Co. (Holding Company for Metallurgical Industries, 100%)	NA	NA.
Do.	Rasheed Performance Minerals Group (RPM)	Borg El Arab Industrial Development Zone	100.
Bentonite	do.	do.	225.
Carbon black	Alexandria Carbon Black Co. (Egyptian Holding Co. for the Chemical Industry, 49%; Inco-Bharat, 36%; Grasim Industries, 15%)	do.	20.
Cement	Egyptian Cement Co. (Lafarge S.A., 54%; private interests, 26%; Holcim Ltd., 20%)	70 kilometers east of Cairo	10,000.
Do.	Amirya Cement Co. (Cimentos de Portugal, SGPS, S.A.)	do.	4,450.
Do.	Assuit Cement Co. (Cemex Egypt)	Assiut	4,752.
Do.	Arab Swiss Engineering Co. (ASEC) (Suez Cement Co., 68.7%)	Helwan	3,615.
Do.	Al-Arish Cement (Ministry of Defense)	Al-Arish	NA.
Do.	TITAN Cement Egypt (TITAN Cement Co., 100%)	Alexandria and Beni Suef	3,300.
Do.	Suez Cement Co. (Cements Français S.A., 54.2%)	Suez	4,200.
Do.	Helwan Cement Co. (Suez Cement Co., 98.69%)	Helwan	4,500.
Do.	Torah Portland Cement Co. (Suez Cement Co., 66.12%)	Torah	4,625.
Do.	Alexandria Portland Cement Co. (Government, 77%, and private interests, 23%)	El Mex	800.
Do.	National Cement Co. (Government, 77%, and private interests, 23%)	El Tabbin	3,100.
Do.	Misr Beni Suef Cement Co.	Beni Suef	2,800.
Do.	Misr Qena Cement Co. (ASEC Cement, 27.55%; Misr Insurance Co., 10.85%; Egyptian Company for Investment Projects, 10.04%; Egyptian Kuwaiti Investment Co., 9.87%; Misr Company for Life Insurance, 9.37%; National Capital Holding Co., Egyptian Company for Financial Investment, 7.53%; National Investment Bank, 3.32%)	Qena	2,000.
Do.	ASEC Minya Cement Co. (ASEC Cement, 45.1%; Safari Investments, 30.7%; Misr Qena Cement Co., 13.9%; Investment Fund for Developing Countries, 9.2%; others, 1.1%)	El Minya	2,000.
Do.	Sinai Cement Co. (Vicat Group)	Sinai	1,500.
Do.	South Valley Cement Co.	do.	1,400.
Do.	Sinai White Cement Co.	do.	410.
Do.	Arabian Cement Co. (Cementos La Union S.A.)	Ain Al-Sokhna	5,000.
Coke	El Nasr Coke and Chemicals Co. (Government, 100%)	Helwan	1,400.
Copper, refined	Egyptian Copper Works Co. (Holding Company for Metallurgical Industries)	Hagar El Nouatia, Alexandria	130.
Ferrosilicon	Egyptian Ferroalloys Co.	Idfo, Aswan	50.
Fertilizers, nitrogenous	Abu Qir Fertilizer & Chemical Industries Co. [private and public interests, 80.9%, and Egyptian General Petroleum Corp. (EGPC), 19.1%]	Abu Qir A	565 (ammonia), 365 (urea).

See footnotes at end of table.

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TABLE 2—Continued
EGYPT: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Fertilizers, nitrogenous—Continued		Abu Qir Fertilizer & Chemical Industries Co. [private and public interests, 80.9%, and Egyptian General Petroleum Corp. (EGPC), 19.1%]	Abu Qir B	876 (urea).
Do.		do.	Abu Qir C	330 (ammonia), 640 (urea).
Do.		Alexandria Fertilizer Co. (Alexfert) (private, 80%, and Abu Qir Fertilizer and Chemical Industries Co., 20%)	Alexandria	730 (ammonia), 720 (urea).
Do.		Egypt Basic Industries Corp. (EBIC) [Orascom Construction Industries S.A.E. (OCI), 60%]	Ain Al-Sokhna	725 (ammonia).
Do.		Egyptian Chemical Industries-KIMA (Chemical Industries Holding Co., 55.7%; public organizations, 39.2%; private investors, 5.5%)	Aswan	330 (ammonia), 600 (nitric acid), 800 (ammonium nitrate).
Do.		Egyptian Fertilizers Co. [Orascom Construction Industries S.A.E. (OCI), 100%]	Ain Al-Sokhna	800 (ammonia), 1,600 (urea).
Do.		El Delta Company for Fertilizers and Chemical Industries (ASMEDA) (Government, 100%)	Talkha, Mansoura	400 (ammonia), 297 (nitric acid), 570 (urea).
Do.		El Nasr Fertilizers and Chemicals Co. (SEMADCO) (Government, 100%)	Attaka, Suez	132 (ammonia), 193 (nitric acid), 200 (ammonium nitrate).
Do.		Helwan Fertilizer Co. (private)	Free zone, Helwan	438 (ammonia), 700 (urea).
Do.		Misr Fertilizer Production Co. S.A.E. (MOPCO) [Egyptian Petrochemical Holdings Co. (ECHEM), 30.75%; Agrium Inc., 26%; National Investment Bank, 12.82%; Egyptian Natural Gas Holding Co. (EGAS), 7.62%; others, 22.81%]	Free zone, Damietta	876 (ammonia), 650 (urea).
Fertilizers, phosphatic		Abu Zaabal Fertilizers and Chemicals (private, 100%)	Qalyubiyah	730 (superphosphate), 60 (phosphoric acid).
Do.		Egyptian Financial and Industrial Co. (private, 100%)	Kafr El Zayat	900 (superphosphate).
Do.		do.	Assuit	750 (superphosphate).
Do.		Polyserve for Fertilizers and Chemicals (private, 100%)	Cairo	320 (superphosphate).
Do.		Suez Company for Fertilizers Production (Egyptian Financial and Industrial Co., 99.8%)	Ain Al-Sokhna	300 (superphosphate), 20 (dicalcium phosphate).
Fluorspar	metric tons	Egyptian Company for Mineral Resources (ECMR)	NA	4,500.
Gold	kilograms	Sukari Gold Mine Co. [Centamin plc, 50%, and Egyptian Company for Mineral Resources (ECMR), 50%]	Sukari gold mine	10,000.
Do.	do.	Hamash Misr for Gold Mines (Matz Holding Limited Co., 50%, and Egyptian Company for Mineral Resources, 50%)	Hamash gold mine[1]	500.
Ilmenite		El Nasr Mining Co.	NA	120.
Do.		Misr Quarried Development Co.	NA	NA.
Do.		Egyptian Company for Mineral Resources (ECMR)	NA	NA.
Iron:				
Ore		Egyptian Iron and Steel Co. (Government, 100%)	El-Gedida Mine, El Bahariya	1,200.
Oxides		El Nasr Mining Co. (Holding Company for Metallurgical Industries, 100%)	Mines near Sinai and Aswan	150.
Direct-reduced		Ezz El-Dekheila Steel Co. (EZDK) (Al Ezz Steel Rebars S.A., 55%)	El-Dekheila I	720.
Do.		do.	El-Dekheila II	800.
Do.		do.	El-Dekheila III	800.
Do.		Egyptian Sponge Iron and Steel Co. (ESISCO)	Sadat City	1,760.
Do.		Ezz Rolling Mill Co. S.A.E. (Al Ezz Steel Rebars S.A.)	Alexandria and Suez	1,900.
Do.		Suez Steel Co. (Solb Misr)	Suez	1,950.
Kaolin		El Nasr Mining Co.	Al Kalabash, Aswan	500.
Lime		Suez Steel Co. (Solb Misr)	Suez	800.
Methanol		El Delta Co. for Fertilizers and Chemical Industries	Talkha	24.

See footnotes at end of table.

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TABLE 2—Continued
EGYPT: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Natural gas	million cubic meters	Egyptian General Petroleum Corp. (EGPC) (Government, 100%)	Abu Madi	3,800.
Do.	do.	do.	Badreddin-3	3,000.
Do.	do.	do.	Abu Qir/Naf	1,900.
Do.	do.	do.	Ras Shukheir	1,600.
Do.	do.	Grupo Khalda (Repsol YPF, S.A., 50%; Apache Oil Co., 40%; Samsung Corp., 10%)	Khalda	24.
Petroleum:				
Crude	thousand 42-gallon barrels	Gulf of Suez Oil Co. [Egyptian General Petroleum Corp. (EPGC), 50%, and BP p.l.c., 50%]	October field, Suez Gulf	45,000.
Do.	do.	do.	El Morgan field, Suez Gulf	27,000.
Do.	do.	Belayim Petroleum Co. [Egyptian General Petroleum Corp. (EGPC), 50%, and International Egyptian Oil Co., 50%]	Belayim field, Suez Gulf	65,000.
Do.	do.	Suez Oil Company [Egyptian General Petroleum Corp. (EPGC), 50%; Deminex SA, 25%; Repsol S.A., 25%]	Ras Badran field, Suez Gulf	15,000.
Pipeline	do.	Arab Petroleum Pipeline Co. (Governments of Egypt, 50%; Saudi Arabia, 15%; Kuwait, 15%; United Arab Emirates, 15%; Qatar, 5%)	Ain Al-Sokhna to Sidi Kir	875,000.
Refined	do.	Cairo Oil Refining Co. (CORC) (Government, 100%)	Mostorod	51,830.
Do.	do.	do.	Tanta	19,710.
Do.	do.	Alexandria Petroleum Co. (Government, 100%)	Alexandria, El-Mex	41,975.
Do.	do.	El Nasr Petroleum Refining Co. (Government, 100%)	Suez	36,500.
Do.	do.	Assiut Petroleum Refining Co. (Government, 100%)	Assiut	18,250.
Do.	do.	Ameriya Petroleum Refining Co. (Government, 100%)	Alexandria, Amreya	27,375.
Do.	do.	Suez Petroleum Processing Co. (Government, 100%)	Suez	24,820.
Do.	do.	Middle East Oil Refinery [Egyptian General Petroleum Corp. (EGPC), 78%; Engineering for Petroleum and Processing Industry (ENPPI), 10%; Petroleum Projects and Technical Consultations Co. (Petrojet), 10%; Suez Canal Bank, 2%]	Alexandria Amreya Freezone	100,000.
Phosphate rock		El Nasr Mining Co. (Holding Company for Metallurgical Industries, 100%)	Mines at East El Sebaáya, West El Sebaáya, and El Quseir	4,500.
Do.		Phosphate Misr Co. S.A.E.	Abu Tartur	2,500.
Do.		El Wataneya for Mining and Quarries	Aswan	2,100.
Quartz		El Nasr Mining Co. (Holding Company for Metallurgical Industries, 100%)	NA	235.
Do.		Misr Quarried Development Co.	Attaka Mountain	NA.
Do.		Egyptian Company for Mineral Resources (ECMR)	Branice near Marsa Alam	NA.
Salt		El Nasr Salines Co.	Burj Al-Arab	300.
Do.		do.	Sebika	2,000.
Do.		El Mex Salines Co.	El Mex	1,400.
Do.		do.	Port Said	350.
Soda ash		Salvoy Alexandria Sodium Carbonate S.A.E.	Alexandria	50.
Steel:				
Crude		Al Ezz El-Dekheila Steel Co. (EZDK) (Al Ezz Steel Rebars S.A., 55%)	do.	3,000.
Do.		Egyptian Iron and Steel Co. (Hadisolb) (Government, 100%)	Helwan steel plant	600.
Do.		Suez Steel Co. (Solb Misr)	Ain Al-Sokhna	2,000.
Do.		Beshay Steel Group	Sadat City	1,200.
Flat		Al Ezz Flat Steel Co. (Al Ezz Steel Rebars S.A., 55%)	Suez	1,000.
Do.		Egyptian Iron and Steel Co. (Hadisolb) (Government, 100%)	Helwan steel plant	1,000.
Rebar		Al Ezz Steel Rebars S.A.	Sadat City	1,000.
Do.		Al Ezz Rolling Mills	Tenth of Ramadan City	500.
Do.		Delta Steel Mill Co.	Qalyubiyah	200.
Do.		Kandil Steel	Tenth of Ramadan City	1,000.
Do.		Suez Steel Co. (Solb Misr)	Ain Al-Sokhna	2,600.
Do.		National Port Said Steel	Port Said	400.
Do.		Misr National Steel Co.	Heliopolis	360.
Do.		Kouta Steel Group	Port Said	360.

See footnotes at end of table.

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TABLE 2—Continued
EGYPT: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Steel—Continued:				
Rebar—Continued		Egyptian Steel Group	Port Said	300.
Do.		do.	Alexandria	250.
Sulfuric acid		Abu Zaabal Fertilizers and Chemicals (private, 100%)	Qalyubiyah	350.
Do.		Egyptian Financial and Industrial Co. (private, 100%)	Kafr El Zayat	175.
Do.		do.	Assuit	210.
Do.		Suez Company for Fertilizers Production (Egyptian Financial and Industrial Co., 99.8%)	Ain Al-Sokhna	425.
Do.		El-Nasr Co. for Fertilizer and Chemical Industries (SEMADCO)	Attaka	90.
Do.		Middle East Oil Refinery [Egyptian General Petroleum Corp. (EGPC), 78%; Engineering for Petroleum and Processing Industry (ENPPI), 10%; Petroleum Projects and Technical Consultations Co. (Petrojet), 10%; Suez Canal Bank, 2%]	Alexandria Amreya Freezone	20.
Talc		El Nasr Mining Co.	Aswan	50.
Do.		TAS Flowrance Group	do.	NA.
Do.		Egyptian Company for Mineral Resources (ECMR)	Southeastern Desert	NA.
Tin	metric tons	Tantalum Egypt J.S.C. [Tantalum International Pty Ltd., 50%, and Egyptian Company for Mineral Resources (ECMR), 50%]	Abu Dabbab	125.

Do., do. Ditto. NA Not available.
[1]On care-and-maintenance status.

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The Mineral Industry of Equatorial Guinea

By Philip M. Mobbs[1]

Offshore oil and natural gas production dominated Equatorial Guinea's mineral industry activity. In 2011 (the latest year for which data were available), hydrocarbons accounted for an estimated 77% of the gross domestic product at factor cost. Most of the country's hydrocarbon production was exported, although some of the liquefied petroleum gas (LPG) output was consumed locally. Mined clay, gravel, rock, and sand were used by the domestic construction industry (International Monetary Fund, 2013, p. 2).

Mineral resources are the property of the Government, and contracts for hydrocarbon and mineral exploration and production are administered by the Ministerio de Minas, Industria y Energia. Hydrocarbon and mineral exploration and production activity are governed by the Mining Law (law No. 9/2006) and the Hydrocarbon Law (law No. 8/2006). Law No. 7/2003 and amendments form the Environmental Law.

Production

In 2013, slight increases were estimated for the production of methanol, natural gas, and petroleum. Equatorial Guinea presumably produced gold and a variety of crude construction materials (clay, gravel, rock, and sand) but available information was inadequate to make reliable estimates of output. Data on estimated mineral commodity production are in table 1.

Structure of the Mineral Industry

Crude oil, condensate, and natural gas were produced from offshore fields. Hydrocarbon exploration and production activity was governed by production-sharing contracts held by joint ventures of international oil companies and the Government. Guinea Ecuatorial de Petróleos (GEPetrol), which was the national oil company, operated some exploration-stage production-sharing contracts and managed the state's interest in other crude oil exploration and production contracts. Sociedad Nacional de Gas de Guinea Ecuatorial (Sonagas), which was the Government's natural gas company, managed the Government's interest in products derived from natural gas output, such as liquefied natural gas (LNG), LPG, and methanol. In 2013, condensate production began from the Alen field, which was operated by a subsidiary of Noble Energy, Inc. of the United States.

Commodity Review

Industrial Minerals

Cement.—In 2013, Grupo Abayak AKOGA Cemento S.A., which was a subsidiary of Abayak S.A. of Equatorial Guinea, awarded the contract for the construction of a cement plant to FL Smidth & Company A/S of Denmark. The 3,000-metric-ton-per-day-capacity facility, which was to be built at Akoga on the mainland about 120 kilometers southeast of Bata, was expected to begin production in 2016 (Global Cement, 2013).

Mineral Fuels

Natural Gas and Petroleum.—Exxon Mobil Corp. of the United States reported that in 2013 crude oil production from the Zafiro field on Block B was about 48,000 barrels per day (bbl/d), which was about an 11% decrease compared with output in 2012. Hess Corp. of the United States reported that crude oil output from the Ceiba field and the Okume complex decreased by 8% in 2013 to 44,000 bbl/d. Hess also completed an infill drilling and well workover program on the Ceiba field, and in October, Hess began a 14-well infill drilling program at the Okume complex. The new wells were expected to increase the crude oil output of the joint venture of Hess Equatorial Guinea, Inc., Tullow Equatorial Guinea Ltd., and Guinea Ecuatorial de Petróles (GEPetrol) slightly in 2014 (Exxon Mobil Corp., 2014, p. 36; Hess Corp., 2014, p. 3; Tullow Oil plc, 2014, p. 60).

The consortium of GEPetrol, Marathon Oil Co. of the United States, and Noble Energy Equatorial Guinea Ltd. produced condensate and natural gas from the Alba field. Condensate and liquid petroleum gases were removed at the Alba plant on Bioko Island, and the dry gas was sold to Atlantic Methanol Production Com. L.L.C., which produced methanol, and to Equatorial Guinea LNG Holdings Ltd., which liquefied the gas for shipment. In 2013, Noble Energy, Inc. of the United States and partners started production of condensate and natural gas from the three-well Alen field. Condensate was stripped from the gas stream and the gas was reinjected. At yearend, the Alen field produced condensate at the rate of 28,000 bbl/d and the five-well Aseng field produced crude oil at the rate of about 44,000 bbl/d (Marathon Oil Corp., 2014a, p. 9; PA Resources AB, 2014, p. 15).

In 2013, the Ministerio de Minas, Industria y Energia ratified eight new production-sharing contracts for crude oil and natural gas activity. Six of the contracts were for offshore acreage and two were for acreage on the mainland (Ministry of Mines, Industry and Energy, 2013).

The Government and Keppel Corporation Ltd. of Singapore announced plans to build a 2.5-million-metric-ton-per-year (Mt/yr)-capacity floating LNG plant that would process natural gas production from the Block R field, which was operated by Ophir Energy plc of the United Kingdom. Initial production from the floating LNG plant was scheduled to begin in 2016 or 2017. Subsequently, Marathon Oil and Equatorial Guinea LNG Holdings Ltd. wrote off capitalized costs associated with the development of a second LNG train (LNG–2) that had been proposed to be built adjacent to the LNG–1 plant at Punta Europa. Other countries on the Gulf of Guinea, such as

[1]Deceased.

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Cameroon and Nigeria, had been expected to export natural gas to Equatorial Guinea to be processed by LNG–2 (Peng, 2013; Marathon Oil Corp., 2014b).

The proposed 22,000-barrel-per-day-capacity crude oil refinery that was to be built at Mbini on the mainland appeared to have been replaced with a proposed 2.2-million-cubic-meter-capacity oil terminal on Bioko Island that would be used to blend crude oil and store refined petroleum products (International Business Times, 2010; Peng, 2013; Versi and Ford, 2014).

Outlook

Petroleum production from Equatorial Guinea is expected to resume an annual decrease in volume owing to the depletion of producing reservoirs, although the development of additional hydrocarbon resources could potentially offset the decrease in produced oil volume in the short term. Cement imports were expected to be reduced when the new cement plant at Akoga starts production in 2016.

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TABLE 1
EQUATORIAL GUINEA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Thousand 42-gallon barrels unless otherwise specified)

Commodity[3]		2009	2010	2011	2012	2013
Liquefied petroleum gas		8,000	4,000	7,500	7,500	7,500
Methanol	metric tons	960,000	860,000	1,000,000	1,000,000	1,010,000
Natural gas[4]	million cubic meters	7,900	6,500	7,200	7,800	8,000
Petroleum, crude and condensate		112,000	100,000	91,000	98,000	100,000

[1]Estimated data are rounded to no more than three significant digits.

[2]Table includes data available through May 20, 2014.

[3]In addition to the commodities listed, Equatorial Guinea presumably produced gold and a variety of crude construction materials (clay, gravel, rock, and sand) but available information is inadequate to make reliable estimates of output.

[4]Represents sales. At the Alba field, liquid hydrocarbons were removed from gross natural gas production; unsold gas was reinjected into the reservoir for pressure maintenance. Produced natural gas from other offshore fields was flared or reinjected.

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TABLE 2
EQUATORIAL GUINEA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand 42-gallon barrels unless otherwise specified)

Commodity		Major operating companies and major owners	Location of main facilities	Annual capacity
Gold	kilograms	Artisanal placer operations	Aconibe, Coro, and Mongomo	NA
Liquefied natural gas	metric tons	Equatorial Guinea LNG Holdings Ltd. [Marathon Equatorial Guinea Production Ltd., 60%; Sociedad Nacional de Gas de Guinea Ecuatorial (Sonagas), 25%; Mitsui & Co. Ltd., 8.5%; Marubeni Corp., 6.5%]	Punta Europa	3,700,000
Liquefied petroleum gas		Alba Plant LLC [Marathon Oil Co., 52%; Noble Energy Equatorial Guinea Ltd., 28%; Sociedad Nacional de Gas de Guinea Ecuatorial (Sonagas), 20%]	do.	7,700
Methanol	metric tons	Atlantic Methanol Production Co. L.L.C. [Marathon Equatorial Guinea Methanol Ltd., 45%; Samedan Methanol, 45%; Sociedad Nacional de Gas de Guinea Ecuatorial (Sonagas), 10%]	do.	1,100,000
Natural gas	million cubic meters	Joint venture of Marathon Oil Co., 63%; Noble Energy Equatorial Guinea Ltd., 34%; and Guinea Ecuatorial de Petróleos (GEPetrol), 3%	Alba field, Alba Block	8,000
Petroleum:				
Condensate		Joint venture of Marathon Oil Co., 63%; Noble Energy Equatorial Guinea Ltd., 34%; and Guinea Ecuatorial de Petróleos (GEPetrol), 3%	do.	18,000
Do.		Joint venture of Noble Energy, Inc., 44.65%; Guinea Ecuatorial de Petróleos (GEPetrol), 28.75%; Glencore Exploration (EG) Ltd., 24.94%; Atlas Petroleum International Ltd., 1.38%; and PA Resources AB, 0.28%	Alen field, Block O	13,000
Crude		Joint venture of Hess Equatorial Guinea, Inc., 80.75%; Tullow Equatorial Guinea Ltd., 14.25%; and Guinea Ecuatorial de Petróleos (GEPetrol), 5%	Ceiba field, Block G	12,500
Do.		do.	Okume complex (includes the Akom North, the Ebano, the Elon, the Okume, and the Oveng fields), Block G	20,000
Do.		Joint venture of Mobil Equatorial Guinea Inc., 71.25%, and Guinea Ecuatorial de Petróleos (GEPetrol), 28.75%	Zafiro field, Block B	102,000
Do.		Joint venture of Noble Energy, Inc., 40% working interest; Atlas Petroleum International Ltd., 29% working interest; Glencore Exploration (EG) Ltd., 25% working interest; Osborne Resources Ltd.,[1] 6% working interest; and Guinea Ecuatorial de Petróleos (GEPetrol), 5% carried interest	Aseng field, Block I	23,000

Do., do. Ditto. NA Not available.
[1]A subsidiary of PA Resources AB.

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The Mineral Industry of Eritrea

By Thomas R. Yager

Eritrea was a producer of copper, gold, and silver from volcanic massive sulfide (VMS) deposits. The country also produced basalt, brick clay, cement, coral, granite, gravel, gypsum, lime, limestone, kaolin, marble, pumice, quartz, salt, and sand. Eritrea was not a globally important consumer or producer of minerals in 2013.

All mineral resources in Eritrea were the property of the state, and licenses were required for exploration and development. The mining sector was governed by legislation that included Minerals Proclamation no. 68/1995, Mining Income Tax Proclamation no. 69/1995, Regulations on Mining Operations Legal Notice no. 19/1995, and Minerals Proclamation no. 68/1995 Amendment Proclamation no. 165/2011.

Minerals in the National Economy

In 2012 (the latest year for which data were available), the manufacturing sector accounted for 5.9% of the gross domestic product, and the mining and quarrying sector, 1.7%. The value of output from the mining and quarrying sector increased by 3.5%. Gold accounted for 89% of total exports in 2012 (African Development Bank Group, 2014).

Production

In 2013, the production of salt increased by an estimated 21%. The production of gold decreased by 70%, and silver, by 47%. Copper mining started in 2013 (table 1).

Structure of the Mineral Industry

Under Eritrean law, the Government had a 10% free-carried interest in mining operations that were privately owned. The Government also had the right to purchase as much as an additional 30% interest in mining operations (table 2).

Commodity Review

Metals

Copper, Gold, Silver, and Zinc.—In 2013, Nevsun Resources Ltd. of Canada and Government-owned Eritrean National Mining Corp. (ENAMCO) produced 2,900 kilograms (kg) of gold at the Bisha Mine compared with 9,735 kg in 2012. Total sales of silver decreased to 15,799 kg in 2013 from 29,900 kg in 2012. Decreased production was attributable to the depletion of the gold-rich oxide zone reserves at Bisha. In the third quarter of 2013, Nevsun started mining in the copper-rich supergene zone at Bisha. By yearend, Nevsun had produced 21,800 metric tons (t) of copper in concentrate (Nevsun Resources Ltd., 2014, p. 5–7).

Nevsun planned to produce between 82,000 and 91,000 t of copper in concentrate in 2014; the supergene zone was expected to be depleted by the end of 2016. Nevsun had planned to start mining at the zinc-rich primary sulfide zone of the deposit in 2015. From 2017 to 2024, production was planned to be about 98,700 metric tons per year (t/yr) of zinc, 17,100 t/yr of copper, 27,000 kilograms per year (kg/yr) of silver, and 470 kg/yr of gold. The startup of production from the primary sulfide zone was delayed until the first half of 2016 because of the identification of additional reserves in the supergene zone (Nevsun Resources Ltd., 2013, p. 5; 2014, p. 3, 6).

At the end of 2013, Nevsun estimated that reserves in the primary sulfide zone at the Bisha Main VMS deposit were 18.4 million metric tons (Mt) at a grade of 5.66% zinc, 1.02% copper, 46 grams per metric ton (g/t) silver, and 0.68 g/t gold. Reserves in the supergene zone at the Bisha Main deposit were estimated to be 7.4 Mt at a grade of 3.57% copper, 27 g/t silver, and 0.61 g/t gold (Nevsun Resources Ltd., 2014, p. 6).

In May 2013, Sunridge Gold Corp. of Canada completed a feasibility study with positive results for a new mine at its Asmara project. The Asmara deposits include the Adi Nefas VMS copper-gold-zinc deposit, the Debarwa VMS copper-gold deposit, the Emba Derho VMS copper-gold-zinc deposit, and the Gupo gold deposit. Sunridge planned to start mining in mid-2015 (Sunridge Gold Corp., 2013).

In the first phase of the project, Sunridge planned to produce nearly 5,400 kg/yr of silver and 970 kg/yr of gold in concentrate from the oxide zones at Debarwa and Emba Derho. The company also planned to mine 116,000 t of direct-shipping ore from Debarwa at a grade of 15.6% copper, 76.8 g/t silver, and 2.96 g/t gold. In the 15-month second phase, Sunridge planned to produce about 34,100 t/yr of copper, 24,000 kg/yr of silver, and 740 kg/yr of gold from the supergene copper ore at Debarwa and Emba Derho. In the 13-year third phase, the company planned to produce about 64,200 t/yr of zinc, 24,500 t/yr of copper, 21,700 kg/yr of silver, and 680 kg/yr of gold from copper-zinc primary sulfide ore at Adi Nefas, Debarwa, and Emba Derho. The estimated life of the project was more than 16 years (Sunridge Gold Corp., 2013).

China Shanghai Corporation for Foreign and Technological Cooperation (SFECO) of China held a 60% interest in the Zara project, which included the Koka gold deposit. ENAMCO held a 40% interest in the project. SFECO started construction of a new mine at Koka in 2012; production was likely to start in 2014. In a feasibility study completed in 2010, planned output was about 3,200 kg/yr of gold during the estimated 7-year life of the mine. Reserves were estimated to be 4.6 Mt at a grade of 5.1 g/t gold (Tarikh, 2012; Williams, 2013).

In the first half of 2013, Chalice Gold Mines Ltd. of Australia engaged in drilling at the Mogoraib North project. VMS deposits identified during the drilling program were deemed to be subeconomic. Andiamo Exploration Ltd. of the United Kingdom engaged in drilling at the Yacob Dewar VMS deposit in 2013, which was located about 50 kilometers southwest of the Bisha Mine (Chalice Gold Mines Ltd., 2013, p. 4; Williams, 2013).

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Industrial Minerals

Cement.—Eritrea's cement plants were producing at the rate of about 260,000 t/yr in 2012 and 2013. Domestic cement consumption was estimated to be about 320,000 t in 2012 compared with 290,000 t in 2011. Gedem Cement Works and Eritrea Cement Works had capacities of 350,000 t/yr and 45,000 t/yr, respectively. Both plants were operating below capacity because of power shortages; Gedem Cement Works was engaged in the construction of a new generator that would allow the company to operate at full capacity (Edwards, 2013; International Cement Review, 2013; Ghebrihiwet, 2014).

Potash.—South Boulder Mines Ltd. of Australia's Colluli potash project is located in the Danakil Depression region. The company was engaged in a feasibility study of a new mine at Colluli in 2013. Depending on the results of the study, South Boulder could start mining by 2016. Planned production from sylvinite resources was 1 million metric tons per year (Mt/yr) of potash for the estimated 17-year life of the mine. South Boulder also studied the possibility of increasing production to 2 Mt/yr and extending the lifetime of the mine to 26 years by mining carnallite resources. Sylvinite production would reach 1 Mt/yr by 2017, and carnallite production, 1 Mt/yr by 2020. Carnallite resources were estimated to be 309 Mt at a grade of 12.3% potassium chloride (KCl), and sylvinite resources were estimated to be 110 Mt at a grade of 28.4% KCl (South Boulder Mines Ltd., 2013).

Salt.—Eritrea's salt miners were producing at the rate of about 290,000 t/yr in 2013. Assab Salt Works and Salina Salt Works had capacities of 150,000 t/yr and 80,000 t/yr, respectively. About 93% of Eritrea's salt production was exported, and 7% was consumed domestically (Woldu, 2013).

Outlook

Eritrea's mineral sector could expand substantially in the near future. Potash and zinc mining is expected to start in 2016. Gold production is likely to increase because of the planned openings of the Koka project in 2014 and the Asmara North project in 2015. Silver production is expected to increase because of the mining of supergene and primary ore from the Bisha and the Asmara North projects. Copper production is likely to increase in 2014 and decrease after 2016; lower production resulting from the depletion of the supergene zone at the Bisha project would be partially offset by the development of the Asmara North project. Cement output could increase because of a new generator set up by Gedem Cement Works. Brick clay production also could increase in the near future (Ghebrihiwet, 2014).

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TABLE 1
ERITREA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1,2]

(Metric tons unless otherwise specified)

Commodity[3]		2009	2010	2011	2012	2013
Basalt		51,000	52,000	59,000	62,000	62,000
Cement		45,000	45,000	190,000	260,000	260,000
Clays:						
Common		95,000 r	98,000 r	110,000 r	120,000 r	120,000
Kaolin		200	210 r	240 r	250 r	250
Copper		-- [4]	-- [4]	-- [4]	-- [4]	21,800 [4]
Coral		75,000 r	77,000 r	89,000 r	92,000 r	92,000
Gold	kilograms	30	50	11,788 r,4	9,735 r,4	2,900 [4]
Granite		24,000 r	25,000 r	28,000 r	29,000 r	29,000
Gravel		89,000 r	92,000 r	105,000 r	110,000 r	110,000
Gypsum		1,000 r	1,000	1,200 r	1,200	1,200
Lime		155,000 r	170,000 r	190,000 r	190,000 r	190,000
Limestone		3,300 r	3,400 r	4,000 r	4,100 r	4,100
Marble, block	cubic meters	35,000 r	36,000	41,000 r	42,000 r	42,000
Pumice		60	65 r	70 r	75 r	75
Quartz		100	110 r	120 r	120 r	120
Salt		70,000 r	120,000 r	180,000 r	240,000 r	290,000 r
Sand	thousand metric tons	2,600 r	2,700 r	3,000 r	3,200 r	3,200
Silver[5]	kilograms	--	-- r	4,400 r	29,900 r	15,799 [4]

rRevised. -- Zero.

[1]Estimated data are rounded to no more than three significant digits.

[2]Table includes data available through July 31, 2014.

[3]In addition to the commodities listed, feldspar and talc were thought to be produced, but information is inadequate to confirm output.

[4]Reported figure.

[5]Reported sales.

TABLE 2
ERITREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Brick		Dahlak Brick and Block Factory	Plant at Massawa	7,300 e
Cement		Gedem Cement Works	Gedem	350,000
Do.		Eritrea Cement Works	Massawa	45,000
Copper		Bisha Mining Share Co. (Nevsun Resources Ltd., 60%, and Eritrean National Mining Corp., 40%)	Bisha Mine near Bishia	86,000
Gold	kilograms	do.	do.	2,900
Granite	cubic meters	Margran plc	Gogne	3,000
Lime		Badme Construction Co.	Plants at Gogne	7,300
Do.		do.	Plant at Barentu	1,800
Marble	cubic meters	Margran plc	Gheleb	5,000
Salt		Assab Salt Works	Assab	150,000
Do.		Salina Salt Works	Massawa	80,000
Silver	kilograms	Bisha Mining Share Co.	Bisha Mine near Bishia	16,000

eEstimated. Do., do. Ditto.

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The Mineral Industry of Ethiopia

By Thomas R. Yager

In 2013, Ethiopia played an important role in the world's production of tantalum; the country's share of global tantalum mine production amounted to about 1%. Other domestically important mining and mineral processing operations included cement, crushed stone, gemstones, and gold. Ethiopia was not a globally important consumer of minerals (Papp, 2015).

Minerals in the National Economy

In 2013, the construction sector accounted for 4.6% of the gross domestic product; manufacturing, 3.6%; and mining and quarrying, 1.2%. The value of output by the construction sector increased by 30.9% in 2013; manufacturing, by 10.8%; and mining and quarrying, by 6.8%. In fiscal year 2013 (July 8, 2012, to July 7, 2013), Ethiopia's mineral exports were valued at $593 million, of which $584 million was gold. Minerals accounted for 19% of the value of total exports. Between 300,000 and 350,000 artisanal miners were employed in gold mining and about 50,000 were employed in gemstone mining (Araya, 2013; Beyene, 2013; African Development Bank Group, 2014; Ministry of Finance and Economic Development, 2014, p. 22, 24, 43–44).

Production

In fiscal year 2013, the production of silica sand increased by an estimated 371% compared with that of fiscal year 2012; lime, by an estimated 120%; most gemstones, by between 50% and 57%; cement, by an estimated 43%; and most construction materials, by between 25% and 31%. The production of tantalum decreased by an estimated 89% in fiscal year 2013, and niobium, by an estimated 87% (table 1).

Structure of the Mineral Industry

At the end of 2013, Ethiopia had 19 cement plants, of which 17 were privately owned; Mugher Cement Enterprise and Messebo Building Materials Production plc were state owned. Companies that mined gold, marble, silica sand, and soda ash were privately owned. State-owned Ethiopian Mineral Development Share Co. (EMDSC) produced dolomite, feldspar, columbite-tantalite, and quartz. Artisanal miners produced columbite-tantalite, gemstones, gold, and salt (table 2).

Commodity Review

Metals

Gold.—In fiscal year 2013, artisanal miners produced 8,387 kilograms (kg) of gold compared with the Government's target of 13,200 kg. Production in Oromia Regional State was 3,317 kg; Tigray Regional State, 2,299 kg; Benishangul-Gumuz Regional State, 1,084 kg; Gambella Regional State, 1,040 kg; and Southern Nations, Nationalities, and Peoples' Regional State, 547 kg (Addis Fortune, 2013).

Midroc Gold Mine plc (a subsidiary of Midroc Group of Saudi Arabia) operated the Lega Dembi Mine. In fiscal year 2013, exports by Midroc Gold Mine were 4,194 kg compared with the Government's target of more than 5,400 kg. The Government planned to increase gold exports from large-scale mines to 8,700 kg in fiscal year 2015 (Addis Fortune, 2013; Ministry of Finance and Economic Development, 2014, p. 29).

In December 2012, Nyota Minerals Ltd. of Australia completed a feasibility study on a new mine at the Tulu Kapi project. Nyota planned to produce nearly 3,300 kilograms per year (kg/yr) of gold at Tulu Kapi during the estimated 10-year life of the mine. Reserves were estimated to be 16.9 million metric tons (Mt) at a grade of 1.82 grams per metric ton gold. In December 2013, Nyota sold a 75% interest in Tulu Kapi to Kefi Minerals plc of the United Kingdom. Kefi and Nyota were engaged in a revised mining plan that would result in production of about 2,600 kg/yr. Mining could start in 2015 (Mining Journal, 2012; Nyota Minerals Ltd., 2013).

Stratex International plc of the United Kingdom engaged in drilling at the Black Rock prospect in Afar in 2013. In October, Alecto Minerals plc of the United Kingdom formed a joint venture with Centamin plc of the United Kingdom to explore at the Aysid-Metekel and the Wayu Boda projects (Stratex International plc, 2014, p. 11).

Niobium (Columbium) and Tantalum.—In May 2012, EMDSC suspended production of columbite-tantalite at the Kenticha Mine because of Government plans to stop exporting unprocessed concentrates and to focus on building a new plant for downstream processing. The Government lifted the ban in 2013 (Araya, 2013).

Elenilto Minerals & Mining plc of the United Kingdom held properties near the Kenticha tantalum mine with resources of more than 17,000 metric tons (t) of contained tantalum. The company planned to produce 600 metric tons per year (t/yr) of columbite-tantalite from a new mine. Elenilto also planned to process columbite-tantalite to niobium pentoxide and tantalum pentoxide starting in the fourth quarter of 2015 and tantalum metal powder starting in 2017 (Ryan's Notes, 2013).

Cooperatives of artisanal miners produced columbite-tantalite in Oromia Regional State. The mining operations were shut down by the Government's ban on unprocessed columbite-tantalite exports in May 2012. After the ban was lifted, artisanal miners exported nearly 33 t of columbite-tantalite in fiscal year 2013 (Addis Fortune, 2013; Araya, 2013).

Industrial Minerals

Cement.—Domestic cement production increased to an estimated 5 Mt in fiscal year 2013 from 3.5 Mt in fiscal year

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2012 and a revised 2.08 Mt in fiscal year 2011. Increased production was attributable to the opening of new plants and the expansion of existing plants; demand increased with the rapid growth in the construction sector.

Ethiopia had 19 operating cement plants with a total capacity of about 12.1 million metric tons per year (Mt/yr) at the end of 2013 compared with 18 plants with a total capacity of 11 Mt/yr at the end of 2012 and 15 plants with a total capacity of 7.9 Mt/yr at the end of 2011. In 2012, Derba Midroc Cement plc started production at two plants at Derba with capacities of 2.5 Mt/yr and 90,000 t/yr, respectively. Operations at Ture Dire Dawa Cement Factory Share Co.'s plant at Dire Dawa, which had a capacity of 550,000 t/yr, started in November 2012. National Cement Share Co. completed its new plant near Dire Dawa with a capacity of 1.1 Mt/yr in 2013 (International Cement Review, 2012a, b; 2013b; Edwards, 2013; National Cement Share Co., 2014).

In 2013, Dangote Cement plc of Nigeria started construction on a new plant at Mugher. Dangote was likely to complete the planned 1.5-Mt/yr-capacity plant in the third quarter of 2014. Habesha Cement Share Co. also planned to complete a new plant with a capacity of 1.4 Mt/yr in 2014 (International Cement Review, 2013a).

Gemstones.—Artisanal miners produced gemstones, including amethyst, aquamarine, emerald, garnet, opal, peridot, sapphire, and tourmaline. In fiscal year 2013, gemstone exports were 25,078 kg compared with the Government's target of 18,000 kg. Opal accounted for 98% of gemstone exports by value. The Government's target for fiscal year 2014 was 15,000 kg of exports, which included 250 kg of cut and polished gemstones. In August, the Government reversed its decision to ban rough gemstone exports at the start of fiscal year 2014; most exporters lacked gemstone cutting and polishing machinery (Addis Fortune, 2013; Araya, 2013).

Lime.—In June 2013, Derba Lime and Chemicals (DLC) (a subsidiary of the Midroc Group) started production at its new lime plant near Derba, which had a capacity of 73,000 t/yr. DLC and Senkele Lime Factory produced lime for external customers, and Caustic Soda Share Co. and Wonji Shoa Sugar Factory produced mostly for their own consumption (Tiret Magazine, 2014).

Potash.—In April 2013, Allana Resources Inc. of Canada completed a feasibility study with favorable results on a new mine at the Dallol potash deposits. Allana planned to produce 1 Mt/yr of potash at Dallol, which is located in the Dankali Depression, during the estimated 25-year life of the mine. The company planned to start mining in early 2016. Reserves at Dallol were estimated to be 94 Mt at a grade of 28.6% potassium chloride (KCl), and total measured and indicated resources were estimated to be 327 Mt at a grade of 28.6% KCl (Northern Miner, 2013).

Silica.—Ethiopia Hansom International Glass plc resumed production at its glass plant in November 2012; operations had been suspended in April 2012. The company, which consumed domestically produced silica sand, planned to produce at about 50% of its capacity of 42,000 t/yr because of high fuel oil prices (Worku, 2012).

Soda Ash.—Abijata-Shalla Soda Ash Share Co. [National Mining Corp. plc (NMiC), 62%, and Government, 38%] produced about 5,000 t/yr of soda ash from Lake Abijata for domestic consumption. In November 2012, the company signed an agreement with China National Complete Plant Import Export Corp. to conduct a feasibility study on a new processing plant. The plant, which would use brine from nearby Lake Shala, was likely to have an initial capacity of 200,000 t/yr. In the second phase of the project, capacity would expand to 1 Mt/yr. Depending on the results of the study, the plant could open in 2017. NMiC and the Government also planned to rehabilitate the existing plant to continue production until the new plant opened (Tiret Magazine, 2012, 2013).

Mineral Fuels

Coal.—Delbi Coal Mining Share Co. operated a mine near Delbi that produced lignite; the company planned to produce 30,000 t in fiscal year 2014. In October 2013, Delbi Coal signed an agreement with May Flower Mining Enterprise Ltd. of India to increase the mine's output to 200,000 t/yr. May Flower planned to invest $116 million during a 3-year period in return for a 70% interest in the mine (Ventures Africa, 2013).

Petroleum.—As of the end of 2013, Ethiopia was not a producer of crude or refined petroleum and relied on imported petroleum products. In December, Africa Oil Corp. of Canada and Tullow Oil plc of the United Kingdom were drilling the Tutule-1 well at the South Omo Block near the border with Kenya and the El Kuran-3 well at Block 8 in the Ogaden Basin (Oil & Gas Journal, 2013).

Outlook

Cement production is likely to increase between 2014 and 2017 because of growth in the construction sector. The production of clay, gypsum, limestone, and pumice is expected to increase because of increased demand from cement plants; output of other construction materials is also likely to increase. The outlook for niobium and tantalum is for an increase in production in 2014 because of the repeal of the ban on unprocessed columbite-tantalite exports. Lime output is expected to increase in 2014 and 2015 because of the opening of DLC's new plant. Production of gold and soda ash are likely to increase starting in 2015 and 2017, respectively. Potash mining is likely to start in 2016. Coal production is also planned to increase in the next few years.

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TABLE 1
ETHIOPIA: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2009	2010	2011[e]	2012[e]	2013[e]
Cement, hydraulic		1,688,014	1,638,613	2,082,366 [r, 4]	3,500,000	5,000,000
Clays:[5]						
Brick clay[e]		39,000	53,000	55,000 [r]	68,000 [r]	89,000
Kaolin, china clay		3,534 [4]	3,600	4,000 [4]	4,500 [r]	4,800
Other clay	cubic meters	300,000	12,398	40,958 [4]	46,000	49,000
Coal, lignite		15,000	20,000	20,000	20,000	20,000
Columbite-tantalite, ore and concentrate:						
Gross weight	kilograms	397,544	252,433	285,000	380,000	50,000
Nb content	do.	27,800	21,600	24,500	26,000	3,500
Ta content	do.	98,500	81,600	94,500	91,000	9,800
Diatomite[e]		4,104 [4]	4,000	4,000	4,500 [r]	4,800
Feldspar		750	1,500	441 [4]	500 [r]	530
Gemstones:						
Amethyst	kilograms	6	7	-- [4]	--	--
Aquamarine	do.	10	105	667 [4]	700	1,100
Citrine	do.	5	1	3 [4]	3	5
Emerald	do.	7	10	15	15	23
Garnet	do.	4	24	29 [4]	30	45
Morganite	do.	1	4	1 [4]	1	2
Opal	do.	651	12,821	13,839 [4]	14,000	21,000
Peridot	do.	4	--	7 [4]	10	15
Quartz	do.	7	2,853	1,492 [4]	1,500	2,300
Ruby	do.	19	26	56 [4]	55	85
Sapphire	do.	--	1	45 [4]	45	70
Tourmaline	do.	1	2	103 [4]	110	170
Gold, mine output, Au content	do.	4,005	6,773	10,891 [4]	12,311 [4]	12,581 [4]
Gypsum and anhydrite, crude		37,000	41,000	46,000	52,000	52,000
Lime		3,829	3,254	2,481 [r, 4]	2,500	5,500
Platinum, mine output, Pt content	kilograms	10	8	-- [4]	--	--
Quartz		200	280	363 [4]	410 [r]	440
Salt, rock		350,709	330,359	388,153 [4]	440,000	470,000
Silver, mine output, Ag content	kilograms	771	1,100 [e]	1,700	1,900	2,000

See footnotes at end of table.

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TABLE 1—Continued
ETHIOPIA: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2009	2010	2011[e]	2012[e]	2013[e]
Soda ash, natural		4,046	4,000	4,500 [r]	5,000 [r]	5,000
Steel:						
Crude[e]		150,000	150,000	130,000	130,000	130,000
Semimanufactured[6]		785,925	464,304	500,000	500,000	500,000
Stone, sand and gravel:[5]						
Basalt:						
Construction stone		1,300,000	1,400,000	1,600,000	2,000,000 [r]	2,600,000
Other[e]		77,000	85,000	96,000	120,000 [r]	160,000
Dolomite		2,600	2,900 [e]	3,190 [4]	4,000 [r]	5,200
Granite[e]	square meters	5,100	5,700	6,400	8,000 [r]	10,000
Ignimbrite[e]	cubic meters	390,000	430,000	490,000	610,000 [r]	800,000
Limestone:						
Slab and tiles	square meters	2,973	3,300 [e]	3,700	4,600 [r]	6,000
Other[e]	thousand metric tons	2,100	2,300	2,600	3,200 [r]	4,200
Marble:						
Slab and tiles	square meters	114,374	152,421	143,820 [r, 4]	180,000 [r]	240,000
Terrazzo[e]	do.	150,000	170,000	190,000	240,000 [r]	310,000
Block and other		145,000	250,000	280,000	350,000 [r]	450,000
Pumice		250,000	128,106	254,152 [4]	320,000 [r]	420,000
Rhyolite[e]		29,000	32,000	36,000	45,000 [r]	59,000
Sand[e]	thousand metric tons	860	950	1,100	1,400 [r]	1,800
Sandstone[e]	do.	1,800	2,000	2,300	2,900 [r]	3,800
Scoria[e]		180,000	200,000	230,000	290,000 [r]	380,000
Silica sand		30,700	70,250	7,000	7,000	33,000

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. do. Ditto. -- Zero.

[1]Table includes data available through January 23, 2015.

[2]Data are for the Ethiopian fiscal year ending July 7 of the year listed, except for steel, which are for the calendar year ending December 31 of the year listed.

[3]In addition to the commodities listed, glass, sulfuric acid, and talc reportedly were produced, but information is inadequate to estimate output.

[4]Reported figure.

[5]When reported as volume or pieces, conversions to metric tons are estimated.

[6]Galvanized steel sheets only.

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TABLE 2
ETHIOPIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Caustic soda		Caustic Soda Share Co.	Plant at Ziway	10,000.
Cement		Derba Midroc Cement plc	Plant at Derba	2,500,000.
Do.		do.	do.	90,000.
Do.		do.	Plant at Dejen	90,000.
Do.		Mugher Cement Enterprise (Government, 100%)	Plant at Mugher	2,276,000.
Do.		Messebo Building Materials Production plc (Government, 100%)	Plant at Mekele	2,240,000.
Do.		National Cement Share Co.	Plant at Dire Dawa	1,100,000.
Do.		do.	do.	150,000.
Do.		East Cement Share Co.	Plant at Dukem	750,000.
Do.		Ture Dire Dawa Cement Factory Share Co.	Plant at Dire Dawa	550,000.
Do.		Capital Clinker and Packaging plc	NA	450,000.
Do.		Pioneer Cement plc	NA	450,000.
Do.		Huang Shan Cement plc	Plant near Modijo	435,000.
Do.		Encheni Medrock Cement plc	NA	300,000.
Do.		Jiangsu Zhongshun Import and Export Trade Company Ltd.	Plant at Dukem	250,000.
Do.		Hua Yu Cement	NA	150,000.
Do.		Red Fox International Investment plc	Plant at Adama	100,000.
Do.		Abyssinia Cement plc	Plant at Chancho	90,000.
Do.		Derbasina Business Industries plc	Plant at Holeta	90,000.
Do.		Jema Cement plc	Plant in North Shoa zone	45,000
Clay:				
Kaolin		Ethiopian Mineral Development Share Co. (EMDSC) (Government, 100%)	Mine at Bamba Wuha	7,500.
Other		Pioneer Cement plc	Mine near Melka Jebdu	67,000.[e]
Coal, lignite		Delbi Coal Mining Share Co.	Mine at Delbi	30,000.[e]
Dolomite		Ethiopian Mineral Development Share Co. (EMDSC) (Government, 100%)	Mine at Soloka	8,000.[1]
Feldspar		do.	Kenticha Mine near Borena	8,000.[1]
Gemstones, opal	kilograms	Artisanal miners	Mine at Wegel Tena	NA.
Do.		do.	Mine near Gashena	NA.
Glass		Ethiopia Hansom International Glass plc [CGC Overseas Construction Ltd. (CGCOC) and China-Africa Development Fund]	Plant at Addis Ababa	42,000
Do.		Addis Ababa Bottle and Glass Share Co.	do.	8,000.
Gold	kilograms	Midroc Gold Mine plc (subsidiary of Midroc Group)	Mine at Lega Dembi	4,200.
Do.	do.	Artisanal miners	Mines in Oromia Regional State	3,300.[e]
Do.	do.	do.	Mines in Tigray Regional State	2,300.[e]
Do.	do.	do.	Mines in Benishangul-Gumuz Regional State	1,200.[e]
Do.	do.	do.	Mines in Gambella Regional State	1,100.[e]
Do.	do.	do.	Mines in Southern Nations, Nationalities, and Peoples' Regional State	800.[e]
Do.	do.	do.	Mines in Amhara Regional State	300.[e]
Gypsum		Pioneer Cement plc	Mine near Dewelle	30,000.[e]
Lime		Derba Lime and Chemicals (DLC) (Midroc Group, 100%)	Plant near Derba	73,000.
Do.		Senkele Lime Factory	Plant at Ambo	6,000.[e]
Do.		Caustic Soda Share Co. (Government, 100%)	Plant at Ziway	NA.
Do.		Wonji Shoa Sugar Factory	Plant near Wonji	NA.
Niobium (columbium) and tantalum, ore and concentrate		Ethiopian Mineral Development Share Co. (EMDSC) (Government, 100%)	Kenticha Mine near Borena[2]	90 tantalum; 20 niobium.
Do.		Artisanal miners	Mines in Oromia Regional State	25 tantalum; 14 niobium.
Platinum	kilograms	Nyota Minerals Ltd.	Mine at Yubdo[2]	10.[e]

See footnotes at end of table.

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TABLE 2—Continued
ETHIOPIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Quartz		Ethiopian Mineral Development Share Co. (EMDSC) (Government, 100%)	Kenticha Mine near Borena[2]	8,000.[1]
Salt		Artisanal miners	Mines at Afdera Lake	NA.
Silica sand		CGC Overseas Construction Ltd. (CGCOC)	Mine near Lemi	180,000.[e]
Soda ash		Abijata-Shalla Soda Ash Share Co. [National Mining Corp. plc (NMiC), 62%, and Government, 38%]	Mine at Lake Abijata	20,000.
Steel:				
Crude		Abyssinia Integrated Steel plc	Plant at Debre Zeit	150,000.[e]
Do.		Sheba Steel Mills plc	do.	20,000.[e]
Semimanufactured		Abyssinia Integrated Steel plc	do.	150,000.
Do.		Zuquala Steel Rolling Mill Enterprise (Government, 100%)	do.	36,000.
Do.		Wallia Steel Factory	Plant at Alemgena	36,000.
Do.		Sheba Steel Mills plc	Plant at Debre Zeit	20,000.
Stone, crushed		CGC Overseas Construction Ltd. (CGCOC)	Plant at Addis Ababa	930,000.[e]
Stone, dimension	cubic meters	Ethiopian Marble Processing Enterprise (Government, 100%)	Mines at Eckonti, Harar, and Mankush	5,000.[e]
Do.	square meters	do.	Plants at Addis Ababa, Bole, and Nifas Silk	65,000.
Do.	cubic meters	National Mining Corp. plc (subsidiary of Midroc Ethiopia Group)	Mines at Beninshangul and Harar	4,500.
Do.	square meters	do.	Plant at Awash	60,000.
Do.	cubic meters	Saba Stones	Mines in Tigray Region	4,500 marble; 2,200 limestone; 1,500 granite.
Sulfuric acid		Melkasa Aluminum Sulfate and Sulfuric Acid Factory	Plant at Melkasa	14,600.

[e]Estimated. Do., do. Ditto. NA Not available.
[1]The combined capacity for the dolomite, feldspar, and quartz processing plant at the Kenticha Mine is 8,000 metric tons per year.
[2]Not operating at the end of calendar year 2013.

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THE MINERAL INDUSTRY OF GABON

By Omayra Bermúdez-Lugo

In 2013, Gabon's economy depended largely on the world demand for manganese and petroleum, which were the country's principal mineral export commodities. Gabon was among the world's top 5 producers of manganese and among Africa's top 10 producers of crude petroleum. Other mineral commodities produced in the country included cement and gold. Identified but undeveloped mineral resources included iron ore, niobium (columbium), and phosphate rock.

Table 1 provides data on the principal mineral commodities produced in Gabon from 2009 to 2013, and table 2 provides a list of major mineral industry facilities in 2013. More-extensive coverage of the mineral sector of Gabon can be found in the 2011 and 2012 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East (available on the Internet at http://minerals.usgs.gov/minerals/pubs/country/africa.html).

TABLE 1
GABON: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		2009	2010	2011	2012	2013
Cement and clinker:						
Cement, hydraulic[3]	metric tons	250,000 e	223,100 r	225,700 r	220,000 e	200,000 e
Clinker[e]	do.	200,000	160,000	160,000	160,000	160,000
Gold	kilograms	--	--	--	666 [4]	1,136 [4]
Manganese:[5]						
Metallurgical-grade ore, gross weight	thousand metric tons	1,992	3,201	4,070	3,637	4,091
Mn content of ore	do.	881	1,416	1,858	1,650	1,800 e
Natural gas	million cubic meters	--	--	--	--	--
Petroleum:						
Crude[6]	thousand 42-gallon barrels	86,724	92,126	91,615	88,330	85,447
Refinery products[6]	do.	4,891	6,570	8,249	9,928	9,400 e

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. do. Ditto. -- Zero.
[1]Table includes data available through December 31, 2014.
[2]In addition to the commodities listed, clay, crushed stone, diamond, gold produced by artisanal miners, and sand may also be produced, but available information is inadequate to make reliable estimates of output.
[3]Includes cement produced from imported clinker.
[4]Production from the Bakoudou Mine only.
[5]As reported by the International Manganese Institute.
[6]As reported by the Organization of the Petroleum Exporting Countries.

TABLE 2
GABON: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement and clinker:				
Cement, hydraulic		Société des Ciments du Gabon S.A. (Cimgabon) (HeidelbergCement AG through Scancem International ANS, 70.46%)	Cement-grinding plant at Owendo, south of Libreville	240,000.
Do.		do.	Cement-grinding plant at Franceville, southeastern Gabon	170,000.
Clinker		do.	Clinker plant at N'Toum, 40 kilometers east of Libreville	300,000.
Gold	kilograms	Managem Group, 75%, and Government, 25%	Bakoudou Mine, 600 kilometers southeast of Libreville	1,400.
Do.	do.	Artisanal miners	Eteke region	300 to 700.

See footnotes at end of table.

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TABLE 2—Continued
GABON: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Manganese		Compagnie Minierè de l'Ogooué S.A. (Comilog) (Eramet International S.A., 67.25%; Government, 25.4%; other, 7.35%)	Open pit mine at Moanda	4,680,000 ore, gross weight.
Do.		do.	Sintering plant	600,000.
Do.		Compagnie Industrielle et Commerciale des Mines de Huazhou (CICMHZ) [Citic Dameng Holdings Ltd. (DAMENG)]	Bembele Mine, town of Ndjole in Moyen-Ogooue Province	500,000 ore.
Petroleum:				
Crude	thousand 42-gallon barrels	China Petrochemical Corp. (Sinopec) through Addax Petroleum Corp., 92%	Remboue oilfield	NA.
Do.	do.	China Petrochemical Corp. (Sinopec) through Addax Petroleum Corp., 92.5%, and Tullow Oil plc, 3.75%	Obangue oilfield	1,800.
Do.	do.	do.	Tsiengui oilfield	1,800.
Do.	do.	China Petrochemical Corp. (Sinopec) through Addax Petroleum Corp., 31.36%; Vaalco Energy Inc., operator, 28.07%; Sasol Petroleum International, 27.75%; Sojitz Corp., 2.98%; PetroEnergy Resources Corp., 2.34%; Tullow Oil plc, 7.5%	Etame marine block, offshore, including: Avouma oilfield	2,400.
Do.	do.	do.	South Tchibala	NA.
Do.	do.	do.	Ebouri oilfield	NA.
Do.	do.	do.	Etame oilfield	6,570.
Do.	do.	Bowleven plc, 100%	EOV Block	NA.
Do.	do.	Maurel & Prom S.A., 100%	Banio	NA.
Do.	do.	Maurel & Prom S.A., 85%; AIC-Petrofi Ltd., 7.5%; Tullow Oil plc, 7.5%	Onal	NA.
Do.	do.	do.	Omko	NA.
Do.	do.	Perenco Group, 56.25%; Tullow Oil plc, 25%; Oranje-Nassau Energie B.V., 18.75%	Tchatamba Marin oilfield	NA.
Do.	do.	do.	Tchatamba West oilfield	NA.
Do.	do.	do.	Tchatamba South oilfield	NA.
Do.	do.	Royal Dutch Shell plc, 94.3%	Toucan	NA.
Do.	do.	Total Gabon S.A., 100%	Anguille	NA.
Do.	do.	do.	Gonelle	NA.
Do.	do.	do.	Torpille	NA.
Do.	do.	Total Gabon S.A., 57.5%	Avocette	NA.
Do.	do.	Total Gabon S.A., 50%	Baudroie Nord	NA.
Do.	do.	Total Gabon S.A., 47.5%, and Royal Dutch Shell plc, 52.5%	Rabi Kounga	NA.
Do.	do.	Total Gabon S.A., 40%, and Royal Dutch Shell plc, 60%	Atora	NA.
Do.	do.	Total Gabon S.A., 50%, and Vaalco Energy Inc., 50%	Mutamba Iroru	NA.
Do.	do.	Gabon Oil Co., 80%, and Government, 20%	Remboue II	NA.
Refinery products	do.	Société Gabonnaise de Raffinage S.A. (Total Gabon S.A., 58%; Government, 25%; other, 17%)	Port Gentil	7,700.

Do., do. Ditto. NA Not available.

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The Mineral Industry of Ghana

By Omayra Bermúdez-Lugo

In 2013, Ghana's mineral sector was estimated to have contributed 9.8% to the country's gross domestic product (GDP) compared with 9.5% in 2012, and to have accounted for 14.3% of Government revenues. Gold and petroleum exports alone accounted for about 64% of total export earnings. The increase in the mineral sector's share of the GDP was attributed to increased output in the petroleum industry. The mineral sector's contribution to GDP growth, however, decreased to 11.7% from 16.4% in 2012. Export revenues from crude petroleum increased by 30.5% and generated $3.9 billion; gold export revenues decreased by 12% and generated about $5 billion. These revenues of crude petroleum and gold represented about 8% and 10%, respectively, of the country's nominal GDP, which in 2013 was estimated to be $47.8 billion. Ghana was among the world's top 10 producers of gold and among the world's top 15 producers of rough diamond. Other mineral commodities produced in the country included aluminum, bauxite, cement, crude petroleum, lead, manganese, petroleum products, salt, and silver. In addition to these mineral commodities, Ghana produced a variety of crude construction materials, such as clay, lime, limestone, sand and gravel, and stone. Ghana continued to experience electricity supply shortages, which led to blackouts throughout the country—particularly in the capital city of Accra—in early 2013 (Quandzie, 2013; Bank of Ghana, 2014, p. 18; Ghana Chamber of Mines, 2014; Ghana Statistical Service, 2014, p. 5, 7; International Monetary Fund, 2014; Kimberley Process Rough Diamond Statistics, 2014).

Minerals in the National Economy

Nonfuel mineral revenue generated by the members of the Ghana Chamber of Mines decreased by 12% to about $4.8 billion in 2013 from nearly $5.4 billion in 2012. The decrease in revenue was attributed to the decrease in the international price of gold and to the decrease in rough diamond output. Gold accounted for about 96% of these revenues; manganese, 2.8%; and bauxite and diamond, less than 1% each. Member companies of the Ghana Chamber of Mines employed a total of 17,103 people in 2013, 98% of which were reported to be Ghanaian nationals (Ghana Chamber of Mines, 2014).

Government Policies and Programs

The legislative framework for the mineral sector in Ghana is the Minerals and Mining Act 703 of 2006. Under the provisions of the law, no person is authorized to conduct reconnaissance, prospecting, exploration, or mining in Ghana unless the person has been granted a mining license. The law establishes that this is regardless of whether the person holds the rights to the land or not. Artisanal and small-scale gold mining by unlicensed foreign nationals as well as by unlicensed Ghanaian nationals continued unabated in the country despite Government efforts to curb these activities. The Ghana Chamber of Mines reported that the Minerals Commission, which is the Government entity responsible for regulating and managing the use of Ghana's mineral resources and for coordinating Government policy related to them, estimated that small-scale gold mining activities accounted for about 35% of Ghana's total gold output (Ghana Chamber of Mines, 2014, p. 8).

The corporate income tax for mining companies operating in Ghana was 35% and the royalty rate on total revenue earned from the mining of nonfuel minerals was 5%. As of yearend, a proposed new petroleum exploration and production law continued to be under review by the Ghanaian Parliament. Plans to introduce a 10% windfall profit tax on mining companies were put on hold pending further Government consultation with industry stakeholders (PwC Ltd., 2013, p. 23, 26; Wiafe, 2013; Terkper, 2014, p. 7).

Production

In 2013, manganese production was estimated to have increased by 53% to 533,000 metric tons (t); bauxite production increased by 9.9% to 827,000 t; secondary lead production by 3.9% to 3,076 t; gold production (excluding gold mined by artisanal means) by 1.9% to 88,376 kilograms; and crude petroleum output by 34% to 35.5 million barrels. Rough diamond production was estimated to have decreased by 24.7% to 169,000 carats. The outputs of aluminum and petroleum products were estimated to have remained at about the same levels as those of 2012 because both the country's only aluminum smelter and the Tema petroleum refinery continued to operate below production capacity. Cement production was estimated to have remained at about the same level of 3 million metric tons (Mt). Information on artisanal and small-scale gold production as well as of other industrial minerals used in the construction sector, including output data for clay, lime, limestone, sand and gravel, and stone, was inadequate to make reliable estimates of output. Data on mineral production are in table 1.

Structure of the Mineral Industry

The Ministry of Lands and Natural Resources (MLNR), through the Geological Survey Department (GSD), the Minerals Commission, and Precious Minerals Marketing Co. Ltd. (PMMC), oversees all aspects of Ghana's mineral sector. The GSD is responsible for providing reliable and up-to-date geologic information and serves as the repository for the country's geoscientific data. Through its Inspectorate Division, the Minerals Commission institutes and enforces environmental, health, and safety standards in the country's mines and ensures that mining companies and all mining-related activities comply with Ghana's mining and mineral law. The PMMC is responsible for promoting the country's precious minerals and jewelry industry. Ghana National

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Petroleum Corp. (GNPC), through the Petroleum Commission, is responsible for the exploration, development, and production of Ghana's hydrocarbon resources. Ghana National Gas Company (GNGC) is responsible for the development of the country's natural gas resources as well as processing and distributing natural gas from foreign sources. Table 2 is a list of major mineral industry facilities.

Mineral Trade

The Bank of Ghana reported that Ghana's total export earnings were affected by the energy crisis experienced by the country during the first half of 2013 and by the decrease in the international price of its key mineral commodities (Bank of Ghana, 2014, p. 9, 17–18). Total merchandise export receipts amounted to nearly $13.8 billion in 2013 compared with nearly $13.5 billion in 2012. Owing to higher levels of output, petroleum export revenues increased despite the decrease in the international price of crude petroleum. Crude petroleum exports accounted for about 28% of total export receipts, which amounted to nearly $3.9 billion, an increase from about $3 billion in 2012. Exports of bauxite increased by 9.9% to 826,994 t and generated $32.9 million in revenue compared with $28.5 million in 2012. Exports of manganese increased by 35% to about 2 Mt and generated about $135.5 million. Exports of diamond decreased by 28.9% to 160,535 carats and generated $7.4 million in revenue; the average price per carat of these exports decreased by 12.5% to $46.27 from $52.91 in 2012 (Bank of Ghana, 2014, p. 21; Ghana Chamber of Mines, 2014, p. 7; Kimberley Process Rough Diamond Statistics, 2014).

Table 1 provides data on the principal mineral commodities produced in Ghana from 2009 to 2013, and table 2 provides a list of major mineral industry facilities in 2013. More-extensive coverage of the mineral sector of Ghana can be found in the 2011 and 2012 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available on the Internet at http://minerals.usgs.gov/minerals/pubs/country/africa.html#gh.

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TABLE 1
GHANA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2009[e]	2010	2011	2012	2013
Aluminum, primary		--	--	40 [e]	40 [e]	40 [e]
Bauxite, gross weight[3]		490	595	400	753	827
Cement, hydraulic[e, 4]		1,800	2,100	2,500 [r]	3,000	3,000
Diamond[5]	thousand carats	376	334	302	233	169
Gold, mine output, Au content	kilograms	79,883 [6, 7]	76,332 [8]	82,920 [9]	86,699 [7]	88,376 [7]
Lead, secondary[10]	metric tons	--	NA	2,403	2,961	3,076
Manganese:[11]						
Gross weight		882 [6]	1,529	1,729	1,244	1,912
Mn content[e]		248 [6]	426	484	348	533
Petroleum:						
Crude	thousand 42-gallon barrels	--	2,050 [e]	24,196	26,429	35,500 [e, 12]
Refinery products[e]	do.	8,000	10,000	10,000	10,000	10,000
Salt		250	85	100 [e]	100 [e]	100 [e]
Silver, Ag content of exported dore	kilograms	3,928 [6]	3,313	3,088	3,200 [r, e]	3,300 [e]

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. do Ditto. NA Not available. -- Zero.
[1]Table includes data available through December 31, 2014.
[2]In addition to the commodities listed, a variety of crude construction materials (clays, lime, limestone, sand and gravel, and stone) are produced. Output of these commodities is not reported, however, and information is inadequate to make reliable estimates of output.
[3]Figure based on bauxite shipments as reported by the Ghana Chamber of Mines.
[4]All from imported clinker.
[5]Reported by the Kimberley Process Certification Scheme.
[6]Reported figure.
[7]Does not include artisanal and small-scale mining output.
[8]Does not include artisanal and small-scale output, which in 2010 was estimated to be more than 25,000 kilograms.
[9]Does not include artisanal and small-scale output, which in 2011 was estimated to be more than 30,000 kilograms.
[10]Reported data are for fiscal year beginning on March 31 of the year indicated.
[11]Source: International Manganese Institute.
[12]Estimate based on preliminary data reported by the Ministry of Finance.

TABLE 2
GHANA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Aluminum		Volta Aluminum Co. Ltd. (VALCO) (Government, 100%)	Aluminum smelter at Tema	200.
Bauxite		Ghana Bauxite Company Ltd. (GBCL) (Bosai Minerals Group Co. Ltd., 80%, and Government, 20%)	Bauxite mine at Awaso	830.
Cement		Ghana Cement Company Ltd. (GHACEM) (HeidelbergCement AG, 93.1%)	Clinker grinding plant at Takoradi	1,200.
Do.		do.	Clinker grinding plant at Tema	2,200.
Do.		Diamond Cement Ghana Ltd.	Cement plant at Aflao[2]	600.
Do.		Savanna Cement Company Ltd. (SAVACEM) and Diamond Cement Ghana Ltd.	Town of Buipe, Central Gonja District	350.
Diamond	thousand carats	Great Consolidated Diamond Ghana Ltd. (Government, 100%)	Placer mine at Akwatia, Birim Valley	360.
Do.	do.	Artisanal diamond miners	Birim Valley	500 to 900.

See footnotes at end of table.

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TABLE 2—Continued
GHANA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Gold	kilograms	AngloGold Ashanti Ltd., 100%	Obuasi surface and underground mine, 60 km south of Kumasi	17,000.
Do.	do.	do.	Iduapriem Mine, 70 km north of Takoradi	8,800.
Do.	do.	Noble Mineral Resources	Bibiani Mine, 250 km northwest of Accra	3,400.
Do.	do.	Golden Star (Bogoso/Prestea) Ltd. (Golden Star Resources Ltd., 90%, and Government, 10%)	Bogoso/Prestea open pit mine, 300 km west of Accra	7,300.
Do.	do.	Golden Star (Wassa) Ltd. (GSWL) (Golden Star Resources Ltd., 90%, and Government, 10%)	Wassa Mine, 30 km northwest of Tarkwa	7,000.
Do.	do.	do.	Father Brown Mine, 35 km from the town of Bogosu; 80 km south of the Wassa Mine	3,000.
Do.	do.	Gold Fields Ltd., 90%, and Government, 10%	Tarkwa open pit mine and carbon-in-leach and heap-leach plants, 300 km west of Accra	21,800.
Do.	do.	do.	Damang Mine and carbon-in-leach plant, 360 km west of Accra	6,000.
Do.	do.	Newmont Mining Corp., 100%	Ahafo Mine, 290 km northwest of Accra, Brong Ahafo region	17,100.
Do.	do.	do.	Akyem Mine	14,000.
Do.	do.	Endeavour Mining Corp., 90%, and Government, 10%	Nzema Mine, 280 km west of Accra, East municipal district	3,100.
Do.	do.	Chirano Gold Mine Ltd. (Kinross Gold Corp., 90%, and Government, 10%)	Chirano Mine, 100 km southwest of Kumasi, southwestern Ghana	9,000.
Do.	do.	Perseus Mining (Ghana) Ltd. (Perseus Mining Ltd., 90%)	Edikan gold mine	7,200.
Do.	do.	Artisanal and small-scale gold miners	Throughout Ghana	>10,000.
Lead, secondary		Gravita Ghana Ltd. (Gravita India Ltd.)	Tema	6.
Limestone and lime		Carmeuse Lime Products (Ghana) Ltd. (Carmeuse SA)	Takoradi	NA.
Manganese ore		Ghana Manganese Company Ltd. (Ghana International Manganese Co., 90%, and Government, 10%)	Open pit mine at Nsuta-Wassaw, Western region	1,500.
Petroleum, crude	thousand 42-gallon barrels	Tullow Oil plc, 34.71%; Anadarko Petroleum Corp., 23.49%; Kosmos Energy LLC, 23.49%; Ghana National Petroleum Corp. (GNPC), 13.75%; Sabre Oil & Gas Holdings Ltd., 2.81%; E.O. Group Ltd., 1.75%	Jubilee oilfield, 60 km offshore	43,800.
Petroleum products	do.	Tema Oil Refinery (Government, 100%)	Refinery at Tema	16,425.
Salt		Panbros Salt Industry Ltd.	Salt pan at Mendskrom, near Accra	250.
Do.		Elmina Salt Producers Association	Artisanal salt pan mining near Elmina	NA.

Do., do. Ditto. NA Not available. > More than.
[1]Abbreviations used for units of measure include the following: km kilometer.
[2]Used imported clinker.

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The Mineral Industry of Guinea

By Omayra Bermúdez-Lugo

In 2013, Guinea was estimated to be among the world's top five producers of bauxite and to account for nearly 7% of world bauxite output. Bauxite also accounted for 96% of the country's total exports in 2013. In addition to bauxite, Guinea also produced alumina, cement, diamond, and gold. Although the country also produced iron ore, salt, and modest quantities of crude construction materials, such as clay, gravel, sand, and stone, information was inadequate to make reliable estimates of output for 2013 (Bray, 2014, p. 27; Institut National de la Statistique, 2014, p. 166).

Bauxite in Guinea was produced from the Debele, Friguia, and the Sangaredi Mines located in the northern part of the country. Cement was manufactured in the capital city of Conakry, diamond was produced throughout the country by artisanal miners in more than 10 prefectures, and gold was produced from the Kiniero, the Lefa, and the Siguiri open pit mines in the northern and northeastern parts of the country. The Friguia alumina refinery, which was closed temporarily in April 2012 as a result of a dispute over wages between the country's trade unions and United Company RUSAL plc, remained closed in 2013 (United Company RUSAL plc, 2014, p. 15, 34).

In December, Semafo Inc. of Canada placed the Kiniero Mine on care-and-maintenance status as it sought potential buyers to acquire its interest in the mine. The Kiniero Mine produced 569 kilograms (kg) of gold in 2013. Gold production at the Lefa Mine decreased by 5.4% to 5,061 kg owing to the recovery of lower ore grades. Netherlands-based Nordgold N.V., which was the operator of the mine, planned to conduct an infill drilling program at the Lefa Mine in 2014, and invest about $4.6 million in exploration. The Lefa Mine employed a total of 1,852 people in 2013. The Siguiri Mine produced 9,798 kg of gold during the year and employed 3,674 people (AngloGold Ashanti Ltd., 2014; Nordgold N.V., 2014, p. 18, 46–47, 64, 127, 189; Semafo Inc., 2014, p. 20).

Iron ore projects pending development included the Simandou North (Blocks 1 and 2), the Simandou South (Blocks 3 and 4), the Simandou South (Zogota), the Forécariah, and the Kalia projects. In February, the Government approved a social and environmental impact assessment for the Simandou South (Blocks 3 and 4) project. An investment framework for the project was expected to be completed by the first half of 2014 (Rio Tinto plc, 2014, p. 31). The development of the Simandou South (Zogota) and the Simandou North (Blocks 1 and 2) projects remained on hold pending the resolution of a mining rights dispute between the Government and joint-venture partners BSG Resources Ltd. of the United Kingdom and Vale S.A. of Brazil (Bain, 2013).

Bellzone Mining plc. of the United Kingdom, which had announced its first preproduction of iron ore from the Forécariah Mine in December 2012, reported that it would not proceed with further development of the mine in 2013. The company announced that it would instead shift its priorities to the development of its other iron ore asset in Guinea, the Kalia project, which it deemed had better prospects for development given the recent decrease in the international price of iron ore. A bankable feasibility study for the Kalia project was completed in September. The study yielded an updated Joint Ore Reserves Committee (JORC) reserve estimate for the Kalia project of 59.8 million metric tons (Mt) at 54.1% iron and estimated resources (inclusive of the 59.8 Mt of reserves) of 124.2 Mt at 53.5% iron. The development plan for Kalia envisioned the construction of a mine with the capacity to produce about 7 million metric tons per year of iron ore at a grade of 58% iron. Capital costs were estimated to be $865 million (Bellzone Mining plc, 2014, p. 3–4).

Table 1 provides data on the principal mineral commodities produced in Guinea from 2009 to 2013, and table 2 provides a list of major mineral industry facilities in 2013. More-extensive coverage of the mineral sector of Guinea can be found in the 2011 and 2012 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East (available on the Internet at http://minerals.usgs.gov/minerals/pubs/country/).

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TABLE 1
GUINEA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
Alumina		530	597	574	150	–
Bauxite:						
Mine production:						
Wet basis[3]		15,600	17,633	17,440 r	17,823	18,763
Dry basis[e, 4]		14,000 r	15,900 r	15,700 r	16,000 r	16,900
Shipments (dry basis), metallurgical[5]		13,900	15,600	15,600	17,900 r	18,500
Cement		298 [6]	237 [6]	365 r, 7	317 [7]	377 [7]
Diamond[8]	carats	696,731 r	374,096 r	303,785 r	266,800 r	202,365
Gold, mine output, Au content[9]	kilograms	18,091	15,217	15,695	14,790	15,428

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. -- Zero.

[1]Table includes data available through December 30, 2014.

[2]In addition to the commodities listed, Guinea produced modest quantities of crude construction materials (clay, gravel, sand, and stone), iron ore, and salt, but information is inadequate to make reliable estimates of output.

[3]Metallurgical ore estimated to be 13% water.

[4]Data are for wet-basis ore estimated to be 13% water reduced to dry basis estimated to be 7% water.

[5]Data are for shipments of bauxite ore as reported by importing countries.

[6]Reported figure by the Banque Centrale, Ministères du Plan, de l'Économie et des Finances.

[7]Reported figure by the Institut National de la Statistique.

[8]Production is approximately 70% to 80% gem quality. Includes artisanal production.

[9]Does not include artisanal gold mining production, which has historically ranged between 1,500 and 5,000 kilograms per year.

TABLE 2
GUINEA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina		Alumina Company of Guinea Ltd. (ACG) (United Company RUSAL plc, 100%)	Friguia refinery, Fria	650,000
Bauxite		Compagnie des Bauxites de Guinée S.A. (CBG) [Halco Mining Inc. (Alcoa Inc., 45%; Rio Tinto plc, 45%; and Dadco Group, 10%) through Boké Investment Company, 51%, and Government, 49%]	Sangaredi Mine, Kamsar	14,000,000
Do.		Compagnie des Bauxites de Kindia S.A. (CBK) (United Company RUSAL plc, 100%)	Debele Mine, Kindia	3,300,000
Do.		Alumina Company of Guinea Ltd. (United Company RUSAL plc, 100%)	Friguia Mine, Fria	2,100,000
Cement		Ciments de Guinée S.A. (Holcim Ltd., 60%, and Government, 40%)	Conakry grinding plant, 35 kilometers from Conakry Port	600,000
Do.		Ciments d'Afrique (CIMAF)	Dubréka industrial zone, 40 kilometers from Conakry	500,000
Diamond	carats	Association pour la Recherche et l'Explotation du Diamant et de l'Or (Batax Bouna International Mining Corp.)	Aredor Mine	38,000
Do.	do.	Artisanal miners	Mainly in Banankoro	NA
Gold	kilograms	Société Ashanti de Guinée (AngloGold Ashanti Ltd., 85%, and Government, 15%)	Siguiri Mine, 850 kilometers northeast of Conakry	10,300
Do.	do.	Société Minière de Dinguiraye S.A. (Nordgold N.V., 85%, and Government, 15%)	Lefa (Lero-Karta) Mine, 700 kilometers northeast of Conakry	6,100
Do.	do.	Semafo Guinée S.A. (Semafo Inc., 85%, and Government, 15%)	Kiniero Mine, 650 kilometers east of Conakry	1,250
Iron ore		Forécariah Guinea Mining S.A. (Bellzone Mining plc, 42.5%; China International Fund Ltd., 42.5%; Government, 15%)	Forécariah Mine, 160 kilometers southeast of Conakry	1,000

Do., do. Ditto. NA Not available.

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The Mineral Industry of Kenya

By Thomas R. Yager

In 2013, Kenya played a significant role in the world's production of natural soda ash. The country's share of the world's mine production of soda ash amounted to nearly 4% (Dolley, 2014). Other domestically significant mining and mineral processing operations included cement and petroleum refining. Kenya was not a globally significant consumer of minerals.

In 2012, the Government issued regulations requiring mining companies to cede at least 35% of the shares in their new Kenyan operations to domestic companies and investors. The proposed Mining Act, 2013, which was not enacted at yearend, would replace the regulations with a 10% free-carried Government interest in large mining operations (Jiwaji, 2013).

In August 2013, the Government canceled all exploration, mining, and prospecting licenses issued between January 15, 2013, and May 15, 2013, because the licenses reportedly were issued without proper documentation. A total of 43 licenses were revoked. The Government also increased royalty rates on niobium, rare earths, and titanium minerals to 10% from 3%; on coal, to 8% from 4%; and on gold, to 5% from 2.5% (Jiwaji, 2013; Metal Bulletin, 2013; Kushner, 2014).

Minerals in the National Economy

In 2013, the manufacturing sector accounted for 8.9% of the gross domestic product; the construction sector, 4.4%; and the mining and quarrying sector, 0.6%. The value of output in the mining and quarrying sector increased by 7.4% in 2013. Formal employment in the mining and quarrying sector was reported to be 9,414 workers in 2013 compared with 9,001 in 2012. The clay, sand, and stone quarrying subsector employed 5,146 Kenyans in 2013; chemical and fertilizer mineral mining, 1,732; and other mining and quarrying, 2,536. The basic iron and steel manufacturing subsector employed 7,680 Kenyans in 2013; the subsector that produced cement, lime, and plaster, 4,916; other nonmetallic mineral products, 3,412; glass and glass products, 1,789; and petroleum products, 301 (Kenya National Bureau of Statistics, 2014, p. 55, 57, 230–231).

Production

In 2013, Kenya's production of garnet other than green garnet increased by 297% compared with that of 2012; tourmaline, by 265%; aquamarine, by 56%; iolite, by 50%; aluminum, by an estimated 21%; crude and semimanufactured steel, by an estimated 18% each, and salt, by an estimated 16%. The output of fluorspar decreased by 56% in 2013; gold, by 42%; diatomite, by 39%; refined petroleum products, by an estimated 38%; gypsum and ruby, by 17% each; sapphire, by an estimated 16%; green garnet, by 13%; and vermiculite, by 12%. Ilmenite and rutile mining started in 2013 and iron ore mining shut down (table 1; Kenya National Bureau of Statistics, 2014, p. 141, 144; Shadrack Kimomo, Chief Geologist, Kenya Ministry of Mines, written commun., July 17, 2014).

Structure of the Mineral Industry

Most of Kenya's mining and mineral processing operations were privately owned, including the diatomite, fluorspar, gemstone, salt, and soda ash mines; the lime plants; and the steel mills except for Numerical Machining Complex Ltd. All cement plants except for East Africa Portland Cement Company Ltd. (EAPC) were privately owned. The Government held a 52% share in EAPC and a 50% share in Kenya Petroleum Refineries Ltd. (KPRL). Artisanal miners produced gemstones and gold.

Commodity Review

Metals

Gold.—Artisanal miners accounted for most of Kenya's gold production, which was about 2,100 kilograms (kg) in 2013 compared with 3,600 kg (revised) in 2012. Decreased production could be attributable to decreased gold prices (Kenya National Bureau of Statistics, 2014, p. 141).

In 2013, African Barrick Gold plc (ABG) of the United Kingdom engaged in soil sampling and drilling operations at its West Kenya Joint Venture project near Lake Victoria. ABG planned further exploration in 2014 (African Barrick Gold plc, 2014, p. 24).

Iron Ore and Iron and Steel.—Wanjala Mining Co. mined iron ore at Kishushe in 2012. The company's mining license and at least eight iron ore exploration licenses were revoked by the Government in August 2013 (Metal Bulletin, 2013).

Kenya's rolling mills produced about 600,000 metric tons per year (t/yr) of steel products. The country also imported about 1.22 million metric tons (Mt) of steel products in 2013 compared with about 778,000 metric tons (t) in 2012. Recent increases in production and imports were attributable to growth in the construction sector (Jiwaji, 2014; Kenya National Bureau of Statistics, 2014, p. 87).

Niobium (Columbium).—In July 2013, Pacific Wildcat Resources Corp. (PAW) of Canada estimated that niobium resources at the Mrima Hill project were 142 Mt at a grade of 0.71% niobium pentoxide. The Government revoked PAW's mining license in August; the company was appealing the decision at yearend (Pacific Wildcat Resources Corp., 2013; Industrial Minerals, 2014).

Titanium and Zirconium.—In December 2013, Base Resources Ltd. of Australia started mining at the Kwale mineral sands deposit. By yearend, Base Resources had produced 5,539 t of ilmenite and 152 t of rutile. The life of the mine was estimated to be 13 years. During the first 7 years of the project, ilmenite production was likely to be 330,000 t/yr; rutile, 79,000 t/yr; and zircon, 30,000 t/yr. In the subsequent 6 years, production was expected to decline to an average of 200,000 t/yr of ilmenite, 55,000 t/yr of rutile, and 19,000 t/yr of zircon (Ollett, 2013; Base Resources Ltd., 2014).

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Industrial Minerals

Cement.—Kenya had six cement-producing companies with a combined capacity of about 7.5 million metric tons per year (Mt/yr). National cement output increased to 5.06 Mt in 2013 from 4.64 Mt in 2012 and 2.83 Mt in 2008. Increased cement production was attributable to the opening of new plants and the expansion of existing plants. ARM Cement Ltd. planned to start construction of a new plant in Kitui County in late 2014; the capacity of the plant was expected to be 2.5 Mt/yr. Dangote Group of Nigeria was likely to complete a new plant with a planned capacity of 1.5 Mt/yr by 2016. Cemtech Ltd. (a subsidiary of Sanghi Group of India) was expected to complete its new plant with a capacity of more than 1.2 Mt/yr by late 2014 or early 2015. EAPC also planned to increase its capacity to 2 Mt/yr from 1.3 Mt/yr by 2015 (Bamburi Cement Ltd., 2013, p. 9; Global Cement, 2013a, b; International Cement Review, 2013; Kenya National Bureau of Statistics, 2014, p. 133; Kiarie and Njihia, 2014, p. 8).

Cement consumption increased to 4.3 Mt in 2013 from 4.03 Mt in 2012 and 2.16 Mt in 2008 because of growth in the construction sector. From 2008 to 2013, residential and nonresidential construction activity in Kenya's main cities increased by 119% and 115%, respectively. During the same period, the paved road network increased to 11,230 kilometers (km) from 8,879 km (Kenya National Bureau of Statistics, 2014, p. 129, 133, 173).

Fluorspar.—In 2013, Kenya Fluorspar Co. Ltd. (KFC) produced 48,500 t of fluorspar at its Kimwarer Mine compared with 110,000 t in 2012; the company was not producing in October 2013. KFC faced numerous challenges, including high levels of phosphorus in its ore, expensive power and transportation costs, the lack of a domestic market, low prices for fluorspar on global markets, and shortages of skilled labor (DeSimone, 2013; Pablo Dyre, Head of Sales and Marketing, Kenya Fluorspar Co., written commun, March 8, 2013).

Rare Earths.—In July 2013, PAW estimated that rare-earth resources at Mrima Hill were 159 Mt at a grade of 3.86% rare-earth oxides. The Mrima Hill deposit contained a high-grade zone that had resources of 26.4 Mt at a grade of 7.05% rare-earth oxides (Pacific Wildcat Resources Corp., 2013).

Soda Ash.—Tata Chemicals Magadi Ltd. (an indirect subsidiary of Tata Group of India) mined trona from Lake Magadi. In 2013, output increased to 468,215 t from 449,269 t (revised) in 2012. At least 94% of the company's production was exported to India and to African, Asian, and Middle Eastern countries in 2013; soda ash accounted for 2% of the value of total national exports. Soda ash was consumed domestically by glass producers and by ARM in the production of sodium silicate (Kenya National Bureau of Statistics, 2014, p. 73, 141, 175).

Mineral Fuels

Coal.—In early December 2013, the Government announced plans to sign an agreement with Fenxi Mining Industry Co. of China to develop Blocks C and D at Mwingi, which is located 143 km northeast of Nairobi. Fenxi was expected to start mining by mid-2016; coal from Mwingi would be used in a new 900-megawatt-capacity power station in Lamu County (Doya, 2013).

Natural Gas and Petroleum.—In 2013, Tullow Oil plc of the United Kingdom drilled the Etuko-1 well at onshore Block 10BB and the Ekales-1 well at onshore Block 13T with successful results. Africa Oil Corp. of Canada drilled the Bahasi-1 well at onshore Block 9. Anadarko Petroleum Corp. of the United States drilled the Kubwa well at offshore Block L7 in 2013. The company abandoned the Kubwa well and subsequently started drilling at offshore Block L11B. BG Group plc of the United Kingdom planned to start drilling at offshore Blocks L10A and L10B in the Lamu basin in 2014 (Lewis, 2013).

In 2013, production at KPRL's refinery decreased to about 11,500 barrels per day (bbl/d) from 18,500 bbl/d in 2012; output was limited by the refinery's outdated equipment. Essar Energy Overseas Ltd. of Mauritius was considering an upgrade that would increase output to the refinery's nameplate capacity of 80,000 bbl/d by 2018. In 2013, the company decided not to proceed with the expansion because of its high cost. The refinery was shut down in early September (Public Investments Committee of the National Assembly of Kenya, 2014, p. 18).

Outlook

Cement production is likely to increase between 2014 and 2018 because of the planned increases in national capacity to 13.4 Mt/yr from 7.5 Mt/yr. Cement demand is expected to increase because of the Government's plans to build new infrastructure; growth in the construction sector is also likely to result in increased steel production. The production of gypsum, limestone, and pozzolanic materials for use in the cement industry also could increase.

In 2014, zircon production is likely to start and ilmenite and rutile production is likely to increase sharply as the Kwale Mine has its first full year of production. Coal production could start by mid-2016. The outlook for fluorspar, gemstones, and soda ash depends heavily on world market conditions.

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TABLE 1

KENYA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
Aluminum, secondary[e]		7,100 r	7,800 r	8,900 r	9,100 r	11,000
Carbon dioxide gas, natural		15,711	16,345	16,275	19,919 r	18,900
Cement, hydraulic	thousand metric tons	3,320	3,710	4,478	4,640	5,059
Clays:[e]						
Bentonite		65	70	70 r	75	80
Kaolin		900	970 r	1,000 r	1,000 r	1,100
Other		24,000	26,000	27,000 r	28,000	30,000
Diatomite		231	224	713	1,731 r	1,054
Feldspar[e]		30	30	35	35	35
Fluorspar, acid grade		15,667	44,500	117,420	110,000	48,500
Gemstones, precious and semiprecious:						
Amethyst[e]	kilograms	5,000 r	10,000 r	16,000 r	22,100 r,3	20,100 3
Aquamarine[e]	do.	230 r	260 r	290 r	320 r,3	500 3
Cordierite, iolite[e]	do.	110 r	140 r	170 r	200 r,3	300 3
Garnet, green	do.	965	1,075	1,205	1,258 r	1,100
Garnet, other[e]	do.	2,900	3,200	3,600	3,800 3	15,100 3
Ruby	do.	5,575	5,450	6,240	6,625 r	5,500
Sapphire[e]	do.	3,100 r	3,000 r	3,500 r	3,700 r	3,100
Tourmaline[e]	do.	7,600 r	8,200 r	8,800 r	9,400 r,3	34,300 3
Gold, mine output, Au content	do.	1,055	2,355	1,636	3,600 r	2,100
Gypsum and anhydrite[4]		5,345	5,500	6,520	6,653 r	5,500
Iron ore:[e]						
Gross weight		10,000 r	30,000 r	50,000 r	70,500 r,3	-- 3
Fe content		5,700 r	17,000 r	28,000 r	40,000 r	-- 3
Lead, refined secondary[e]		500	750 r	1,000 r	1,000 r	1,000
Lime[e]		50,000 r	52,000 r	52,000 r	55,000 r	55,000
Petroleum refinery products:						
Gasoline	thousand 42-gallon barrels	1,340	1,547	1,522	999 r	615
Kerosene	do.	835	812 r	912 r	518 r	320 e
Jet fuel	do.	1,990	1,935	2,181 r	1,245 r	770 e
Distillate fuel oil	do.	2,907	2,933	3,203	1,786 r	1,153
Residual fuel oil	do.	3,316	2,994	3,463	1,995 r	1,225
Liquefied petroleum gas	do.	341	339	320	198 r	144
Bitumen	do.	2	97	33	--	--
Total	do.	10,731 r	10,657 r	11,634 r	6,741 r	4,200 e
Salt, crude[e]		220,000 r	230,000 r	280,000 r	320,000 r	370,000
Sand, industrial; glass[e]		15,000	16,000 r	17,000 r	18,000	19,000
Soda ash		404,904	473,689	499,052	449,269 r	468,215
Steel:						
Crude[e]		270,000 r	290,000 r	330,000 r	340,000 r	400,000
Semimanufactured[e]		400,000 r	440,000 r	500,000	510,000 r	600,000
Galvanized		182,151	201,410	268,096	255,815	277,754
Sulfuric acid[e]		19,000	21,000 r	22,000 r	22,000 r	23,000
Titanium:						
Ilmenite concentrate		--	--	--	--	5,539
Rutile concentrate		--	--	--	--	152
Vermiculite		315	395	515	457 r	400

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. -- Zero.

[1]Table includes data available through January 9, 2015.

[2]In addition to the commodities listed, a variety of minerals and construction materials [brick clays, gravel, murram (laterite), crushed rock, and construction sand] may be produced, but quantities are not reported, and available information is inadequate to make reliable estimates of output.

[3]Reported figure.

[4]Gypsum production for use in cement only.

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TABLE 2
KENYA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Aluminum, secondary		Booth Manufacturing Ltd.	Plant at Nairobi	4,000.
Do.		Aluminium Enterprises	Plant at Kikuyu	1,200.
Do.		Crystal Industries Ltd.	do.	1,000.
Do.		Narcol Aluminium Rolling	Plant at Mombasa	1,000.
Do.		Aluminium Extruders	Plant at Nairobi	800.
Do.		Kaluworks Ltd.	Plant at Mombasa	NA.
Carbon dioxide gas, natural		Carbacid Ltd.	Plant at Nairobi	35,000.
Cement		Bamburi Cement Ltd. (Lafarge Group, 58.6%)	Plants at Bamburi and Mombasa	2,500,000.
Do.		Savannah Cement Ltd. (Savannah Heights, 40%; Wan-Ho, 40%; Acme Cement, 20%)	Plant at Athi River	1,500,000.
Do.		East African Portland Cement Company Ltd. (EAPC) [Lafarge Group, 41.7%; National Social Security Fund (Government-owned), 27%; Government, 25%]	do.	1,300,000.
Do.		ARM Cement Ltd.	Plant at Nairobi	650,000.
Do.		do.	Plant at Kaloleni	350,000.
Do.		Mombasa Cement Ltd.	Plant at Athi River	800,000.
Do.		National Cement Company Ltd. (a subsidiary of Devki Group of Companies)	do.	350,000.
Diatomite		African Diatomite Industries Ltd.	Kariandusi and Soysambu	10,800.
Fluorspar		Kenya Fluorspar Ltd.	Mine at Kimwarer	120,000.
Glass		Central Glass Industries Ltd.	Plant at Nairobi	51,000.
Do.		Milly Glass Works Ltd.	Plant at Mombasa	45,000.
Gold	kilograms	Artisanal miners	Mines in Nyanza, Rift Valley, and Western Provinces	NA.
Iron ore		Wanjala Mining Co.	Mine at Wanjala[1]	10,000.
Lead, refined secondary		Associated Battery Manufacturers Company Ltd.	Plant at Athi River	3,000.
Lime		Homa Lime Company Ltd.	Plant at Koru	33,000.
Do.		ARM Cement Ltd.	Plant at Kaloleni	25,000.
Petroleum, refined	thousand 42-gallon barrels	Kenya Petroleum Refineries Ltd. (KPRL) (Government, 50%, and Essar Energy Overseas Ltd., 50%)	Refinery at Mombasa[1]	29,200.
Ruby and sapphire	kilograms	Rockland Kenya Ltd.	Mine at Kasigau	6,000.[e]
Salt		Krystalline Salt Ltd.	Plant near Malindi	280,000.[e]
Do.		Kensalt Ltd.	Plant at Mombasa	200,000.[e]
Do.		Tata Chemicals Magadi Ltd.	Plant at Magadi	45,000.
Soda ash		do.	Mine at Magadi	715,000.
Sodium silicate		ARM Cement Ltd.	Plants at Athi River and Kaloleni	60,000.
Steel:				
Crude		Devki Steel Mills Ltd.	Three plants in Kenya	250,000.
Do.		Athi Steel Ltd.	Plant at Athi River	120,000.
Do.		Numerical Machining Complex	Plant at Nairobi	20,000.
Do.		Kenya United Steel Company Ltd. (subsidiary of Alam Group of Companies)	Plant at Mombasa	20,000.
Rolled		Devki Steel Mills Ltd.	Three plants in Kenya	250,000.[e]
Do.		Mabati Rolling Mills Ltd.	Plant at Mombasa	200,000.[e]
Do.		Athi Steel Ltd.	Plant at Athi River	120,000.[e]
Do.		Numerical Machining Complex	Plant at Nairobi	100,000.
Do.		Tarmal Wire Products Ltd.	Plant at Mombasa	84,000.
Do.		Standard Rolling Mills Ltd.	do.	80,000.
Do.		Kenya United Steel Company Ltd.	do.	30,000.
Sulfuric acid		Kel Chemicals Ltd.	Plant at Thika	14,600.
Do.		Pan Africa Chemicals Ltd.	Plant at Webuye	NA.
Titanium		Base Resources Ltd.	Mine in Kwale County	330,000 ilmenite; 79,000 rutile.
Zircon		do.	do.	30,000.

[e]Estimated. Do., do. Ditto. NA Not available.
[1]Not operating at the end of 2013.

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The Mineral Industry of Lesotho

By Philip M. Mobbs[1]

Mining and quarrying played a significant role in Lesotho's economy, with the focus of mineral production concentrated on diamond. Since diamond production activity resumed in 2000, the mining sector's contribution to the gross domestic product had increased to about 4.5% for fiscal year 2010–11[2] (the latest year for which data were available), from about 0.2% in 2000. In addition to mining activity in Lesotho, the country's economy benefited from the remittance of wages from Basotho workers employed in the mines of South Africa, although, for the past two decades, the trend had been that of declining annual remittances for South African employment. The gradual decrease in deep gold mine operations in South Africa and, in recent years, the South African Government's efforts to reduce domestic unemployment, which resulted in an increase in the number of South African citizens working in the mines, had brought about a reduction in the number of Basotho miners recruited to work in South Africa. In 2013, there was an average of about 35,000 Basotho mineworkers in South Africa compared with an average of about 39,000 in 2012, 61,416 in 2003, and 112,722 in 1994 (Central Bank of Lesotho, 2004, p. 73; 2005, p. S-29; 2014, p. 17, S-32; Ruffini, 2010; Ministry of Development Planning, 2013, p. 91; Ministry of Mining, 2014, p. 6).

The Ministry of Mining, which was established in 2012, replaced the Ministry of Natural Resources as the Government agency responsible for regulating Lesotho's mineral industry. The Ministry of Energy, Meteorology and Water Affairs, which also was established in 2012, was responsible for the energy and water sectors. Laws that form the regulatory framework for the mineral industry include Section 36 of the Lesotho Constitution, the Mines and Minerals Act 2005, the Precious Stones Order 1970, and the Mine Safety Act 1981. Other relevant legislation includes the Labor Code Order 1992 and amendments, the Environmental Act 2008, and the Water Act 2008. Lesotho is a member of the Kimberley Process Certification Scheme.

Production

Lesotho's diamond production decreased by about 14% in 2013 owing in part to the Liqhobong Mine being placed on care-and-maintenance status pending the installation of a new treatment plant and the end of a bulk-sampling program at the Lemphane project. Artisanal miners and domestic companies produced small amounts of agate and other semiprecious gemstones, clay, sand and gravel, and stone (both crushed and dimension) for domestic consumption. Such mineral production, however, was not reported. Mineral production data are in table 1 (Ministry of Development Planning, 2013, p. 92–93; Ministry of Mining, 2014, p. 5–6, 9).

[1]Deceased.

[2]The fiscal year runs from April 1 through March 31.

Structure of the Mineral Industry

Table 2 is a list of mineral processing facilities, their locations, and their capacities.

Commodity Review

Industrial Minerals

Diamond.—At yearend, the Kao Mine and the Letseng Mine in northern Lesotho were the only operating diamond mines in the country. Storm Mountain Diamonds (Proprietary) Ltd., which was a joint venture of Namakwa Diamonds Ltd. of Bermuda (62.5%), the Government (25%), and Kimberlite Investments Lesotho Ltd. (12.5%), operated the Kao Mine. The mine, which was located about 4 kilometers (km) south of the Liqhobong Mine, entered commercial production in 2012. The facility had a 500-metric-ton-per-hour (t/hr)-capacity plant for processing kimberlite ore (Namakwa Diamonds Ltd., undated).

Letšeng Diamonds (Proprietary) Ltd., which was a joint venture of Gem Diamonds Ltd. of the British Virgin Islands (70%) and the Government (30%), operated the Letseng Mine. Gem Diamonds reported that 95,053 carats was recovered from 6.2 million metric tons (Mt) of ore mined in 2013 compared with 114,350 carats recovered from 6.6 Mt of ore in 2012. Production, which was primarily from the lower grade Main pipe during the first half of the year, was focused on the higher grade Satellite pipe during the last half of the year. New cone crushers were installed in 2013 to reduce damage to diamonds that was attributed to processing ore through the plant's original secondary and tertiary crushers (Gem Diamonds Ltd., 2014, p. 17–18).

Firestone Diamonds plc of the United Kingdom reported that a definitive feasibility study for a 500-t/hr-capacity main treatment plant (MTP) at the Liqhobong Mine, which was located about 120 km east-northeast of Maseru, was completed in 2012. Liqhobong Mining Development Company (Proprietary) Ltd., which was a joint venture of Firestone Diamonds (75%) and the Government (25%), ended pilot plant operations in 2013. The pilot plant was to be removed in preparation for the construction of the MTP. Commissioning of the MTP was expected to begin in 2016 (Firestone Diamonds plc, 2014a, p. 6–7; 2014b, p. 10).

Mothae Diamonds Holdings Inc., which was a joint venture of Lucara Diamond Corp. of Canada (75%) and the Government (25%), suspended the preliminary economic assessment of the proposed Mothae Mine, and placed the project on care-and-maintenance status pending a review of development options. In December, a memorandum of understanding (MOU) was signed with Meso Diamonds (Proprietary) Ltd., which was a subsidiary of Paragon Diamond Ltd. of the Bailiwick of Guernsey [United Kingdom], for the sale of the Mothae bulk sampling plant. The purchase was

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expected to close in early 2014. Removal of the plant would allow the Mothae pit to be expanded (Lucara Diamond Corp., 2014, p. 5, 19).

A successful initial bulk sampling program was completed in June at the Lemphane project by the joint venture of Meso Diamonds (80% interest) and the Government (20%). A mining lease for the project was expected to be approved in 2014. For the first 2 years of mining, Meso planned to use the 75-t/hr-capacity plant that was to be acquired from Mothae (Paragon Diamond Ltd., 2014, p. 3–4).

Kolo Holding (Proprietary) Ltd. which was a joint venture of the Government, Lesotho investors, and Reskol Diamond Mining (Proprietary) Ltd. (an indirect subsidiary of Batla Minerals SA of France), was expected to resume evaluation of the Kolo diamond project in 2014. The lease was subject to litigation by the former leaseholder, Angel Diamonds (Proprietary) Ltd. of Lesotho (Pasari and Purushothaman, 2013, p. 9).

Outlook

Development of a new Mining and Minerals Policy centered on socio-economic development was a Government priority. The policy was expected to establish an accountable and transparent fiscal and taxation regime for mining, to increase the information available about the country's mineral resources, to eliminate negotiation for diamond mining licenses, to improve the economic and environmental aspects of the artisanal and small-scale mining sector, and to establish an Environmental Production Fund for any additional rehabilitation needed after mine closure operations. Mineral-resource activities were restrained owing in part to the limited availability of electrical power, the lack of transportation infrastructure, and limited domestic and foreign investment in the mineral industry (Ministry of Mining, 2014, p. iii–iv, ix–xii).

Lesotho's economy is vulnerable to mineral-related international shocks and trends, as the country is dependent on imported refined petroleum products and diamond production is subject to changes in consumer demand. Diamond production in Lesotho, however, is expected to increase in the near term as the Kao Mine ramps up to full production and when production at the Liqhobong Mine resumes after the installation of the new kimberlite ore processing plant.

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TABLE 1
LESOTHO: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		2009	2010	2011	2012	2013
Diamond	carats	91,815	104,945 r	211,278 r	478,926	414,014
Fire clay[e]	cubic meters	15,000	14,000	12,000	15,000	15,000

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised.

[1]Table includes data available through September 19, 2014.

[2]In addition to the commodities listed, aggregate, semiprecious gemstones, and stone were produced, but available information is inadequate to make reliable estimates of output.

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TABLE 2
LESOTHO: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aggregate		Moradi (Proprietary) Ltd.	Tabola, about 50 kilometers northeast of Maseru	NA
Clay		Loti Brick (Proprietary) Ltd,	Plant at Thetsane, south of Maseru. Quarries at Ha Motloheloa, Phoqoane, and Tsikoane	NA
Do.		Majara Bricks (Proprietary) Ltd.	Plant and quarry at Berea Hills, about 12 kilometers northeast of Maseru	NA
Diamond	carats	Storm Mountain Diamonds (Proprietary) Ltd. (Namakwa Diamonds Ltd., 62.5%; Government, 25%; Kimberlite Investments Lesotho Ltd., 12.5%)	Kao Mine, about 115 kilometers east-northeast of Maseru	220,000
Do.	do.	Letšeng Diamonds (Proprietary) Ltd. (Gem Diamonds Ltd., 70%, and Government, 30%)	Letseng Mine, about 140 kilometers east-northeast of Maseru	100,000
Do.	do.	Liqhobong Mining Development Company (Proprietary) Ltd. (Firestone Diamonds plc, 75%, and Government, 25%)	Liqhobong Mine,[1] about 120 kilometers east-northeast of Maseru	NA
Do.	do.	Mothae Diamonds Holdings Inc. (Lucara Diamond Corp., 75%, and Government, 25%)	Mothae Mine,[1] about 135 kilometers east-northeast of Maseru	60,000
Sandstone	square meters	Lesotho Smart Sandstone (Proprietary) Ltd.	Lekokaoneng, about 25 kilometers northeast of Maseru	120,000
Do.		Lesotho Stone Enterprises (Proprietary) Ltd.	do.	NA
Do.		Seroma Sandstone Production (Proprietary) Ltd.	do.	NA

Do., do. Ditto. NA Not available.
[1]On care-and-maintenance status at yearend 2013.

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The Mineral Industry of Liberia

By Omayra Bermúdez-Lugo

In 2013, Liberia's estimated real gross domestic product (GDP) increased by 8.1% to $896.7 million. Although the mineral sector accounted for only 10.8% of the GDP, the sector grew by 40% during the year. This growth was largely driven by increased output in the cement, diamond, and iron ore industries. The services sector, however, continued to account for the largest share of the GDP (46.7%), followed by the agriculture and fishery, mineral, forestry, and manufacturing sectors, which accounted for 25%, 10.8%, 10%, and 7% of the GDP, respectively. Export earnings from the mineral sector increased by 125% to $351.2 million in 2013 from $155.8 million in 2012; the majority of these proceeds were generated by the iron ore industry. Projects to rehabilitate roads connecting the southern parts of the country to Guinea and Sierra Leone and to increase electrical power capacity were underway, and foreign companies continued to engage in gold, iron ore, and petroleum exploration activities in the country (Central Bank of Liberia, 2014, p. 10–11; Ministry of Finance, 2014, p. 7–9).

Mineral commodities produced in Liberia included cement, diamond, gold, iron ore, sand, and crushed stone. Other mineral resources, which were still undeveloped, included base metals (such as cobalt, lead, manganese, nickel, and tin), and industrial minerals (such as dolerite, granite, ilmenite, kyanite, phosphate rock, rutile, and sulfur). Liberia continued to make significant progress in the rehabilitation of the mining sector by opening up to foreign direct investment and adhering to global standards for transparency. The country was a participant in the Extractive Industries Transparency Initiative (EITI) and had been compliant with EITI standards since October 14, 2009. Liberia was also a member of the Kimberley Process Certification Scheme (KPCS) (Extractive Industries Transparency Initiative, 2014; Kimberley Process Certification Scheme, 2014).

Government Policies and Programs

The Ministry of Lands, Mines and Energy (MLME) is the Government agency responsible for the administration of the mineral sector, including the granting of mining licenses, and it has statutory oversight of the energy, land, mineral, and water sectors. The mineral sector is regulated by the Mining and Minerals Law of 2000. The Mineral Policy of Liberia was created in March 2010 to complement the Mining and Minerals Law. The document outlines the Government's expectations with regard to the contributions of all stakeholders in the sustainable development of Liberia's mineral resources. These laws were under review in 2013 (AllAfrica Global Media, 2013a; Boima, 2013).

Exports and imports of rough diamond are overseen by the Government Diamond Office (GDO) within the MLME and by the Bureau of Customs. The legal framework for the hydrocarbon sector was provided by the Petroleum Law of 2002. The Government, however, was in the process of reviewing its hydrocarbon sector policies and legislation. A new Petroleum Policy was submitted to Congress in late 2013, and, as of yearend, was pending approval by the Liberian House of Representatives. The National Oil Company of Liberia (NOCAL) is the independent state-owned company charged with coordinating the development of Liberia's hydrocarbon sector (Ministry of Lands, Mines and Energy, 2011, p. 10, 14; Perry, 2013).

In 2013, the Government was in the process of rehabilitating its roads, including 180.4 kilometers (km) of road connecting Red Light to Ganta; 86 km of road segments connecting the Kolahun junction to the Vahun and Bomaru Roads, and the Karweaken Road to the Barclayville Road; 68.6 km of road connecting Gbarnga to the Guinean border; a 13.2-km segment of Somalia Drive connecting the Freeport of Monrovia to Red Light; a 12-km road connecting Caldwell to Louisiana; and 5.1 km of S.K.D. Boulevard. These roads constitute a vital transport route linking the city of Harper in Maryland County, which is located in southeastern Liberia near the border with Côte d'Ivoire, to Liberia's borders with Guinea and Sierra Leone. The rehabilitation of these roads is expected to bring economic development to southeastern Liberia as these roads are expected to be used as a major transport corridor linking domestic as well as regional markets (Ministry of Finance, 2014, p. 8).

Other infrastructure projects underway included the rehabilitation of the Mt. Coffee hydroelectric powerplant, which was to add 80 megawatts (MW) to the national grid, and the construction of a new 10-MW heavy-fuel-oil powerplant at a cost of $10 million to be funded by the Japan International Cooperation Agency and the World Bank. In September, the Government also signed a $144 million line of credit agreement with Export-Import Bank of India for the financing of a project to transmit and distribute electricity to the cities of Buchanan, Ganta, and Kakata. The administration of the project would be carried out by a third party, which would be selected through a competitive bidding process (Ministry of Finance, 2014, p. 9).

In November, ArcelorMittal of Luxembourg, Putu Iron Ore Mining Co. Inc. (a subsidiary of OAO Severstal of Russia), and Western Cluster Ltd. (a subsidiary of Vedanta Resources plc. of the United Kingdom) signed an agreement to establish Liberia's first Chamber of Mines. The proposed Chamber of Mines was to serve as an umbrella organization representing the interests of companies operating mining concessions in Liberia. The Chamber was also to provide advisory services to its members regarding the country's mineral law and its mining regulations and policy (AllAfrica Global Media, 2013b).

Production

In 2013, cement output increased by 49.5% to a reported 181,829 metric tons (t) from 121,592 t in 2012. The Central Bank of Liberia (CBL) attributed the increase in production to expansions at local cement plants in response to increased

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activities in the domestic construction sector. Iron ore production, as reported by the CBL, increased by 42.4% to nearly 4.7 million metric tons (Mt) as a result of increased production from the Western Range Project (WRP). KPCS public statistics on Liberia's rough diamond production were not available; however, the CBL reported diamond output to be 44,334 carats in 2013, which reflected an increase in production of 5.6% compared with that of 2012. The increase in diamond production was attributed to a rise in the number of diamond fields in operation. Gold output was estimated to have decreased by 6.4% to 600 kilograms. Decreased output was reportedly the result of a decrease in the world market price for gold. Information on crushed stone and sand output was estimated (Central Bank of Liberia, 2014, p. 12–13). Data on mineral production are in table 1.

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities.

Commodity Review

Metals

Gold.—Construction work at the New Liberty gold mine was reportedly on schedule and about 33% completed as of yearend 2013. Aureus Mining Inc. of Canada (AMI), which owned the mining rights to the project, completed a definitive feasibility study for the mine in May. The study disclosed a revised reserve estimate of 8.5 Mt grading 3.4 grams per metric ton (g/t) gold in the proven and probable category and resource estimates of 9.8 Mt grading 3.6 g/t gold in the measured and indicated category, and 5.7 Mt grading 3.2 g/t gold in the inferred category. The new reserve estimate was expected to support an open pit operation with a capacity to produce an average of about 3,700 kilograms per year (reported as 119,000 troy ounces per year) for the first 6 years of operation. The New Liberty Mine, which was to be located about 90 km north of the capital city of Monrovia, would be Liberia's first commercial gold mine (Aureus Mining Inc., 2014, p. 6–7).

In November, AMC Consultants (UK) Ltd. of the United Kingdom completed a National Instrument 43–101 resource estimate for AMI's Ndablama and Weaju gold projects in Liberia. Inferred mineral resources were estimated to be 6.8 Mt at a grade of 2.1 g/t gold for Ndablama and 2.7 Mt at a grade of 2.1 g/t gold for Weaju. Exploration was to continue in 2014. The Ndablama and the Weaju projects are located within AMI's Bea Mountain mining concession area in northwestern Liberia [AMC Consultants (UK) Ltd., 2013, p. 10].

Iron Ore.—ArcelorMittal produced about 4.7 Mt of iron ore in 2013, which included direct-shipping ore from its WRP and stockpiled material. The company planned to further increase production capacity to 15 million metric tons per year (Mt/yr) by replacing the current production of direct-shipping ore (60% Fe content) with that of sinter fines (62% Fe content) by the end of 2015. The WRP consisted of three iron ore deposits located about 300 km northeast of the capital city of Monrovia along Nimba County's mountain range. Some deposits within the WRP had been mined during the 1980s and the beginning of the 1990s, but production had ceased in 1992 following the onset of the Liberian civil war. The WRP deposits consist of a highly weathered 250- to 450-meter (m)-thick itabirite iron formation. ArcelorMittal held a 70% interest in the project (ArcelorMittal, 2013, p. 23, 207, 211–212; 2014a, p. 104, 144; 2014b, 211).

The commissioning of the first phase of the development of the Bong Mines took place on July 30, 2013, at Fuama District in lower Bong County. Phase 1 would consist of the setting up of the mining camp and processing facilities and the refurbishing of the railroad between the Bong Mines and Monrovia. Upon completion, Wuhan Iron and Steel (Group) Corp. (WISCO) of Hong Kong, through its subsidiary China Union Mining Co. Ltd., planned to produce about 1 Mt/yr of iron ore and to ramp up production to 10 Mt/yr by 2016 (Executive Mansion of the Government of Liberia, 2013).

Vedanta Resources plc. of India continued to advance its Western Cluster Iron Ore project (WCL). As of June 30, 2013, a total of 91,500 m of drilling had been completed for the project. The company expected to deliver its first shipment of iron ore by March 2014 and to produce 2 Mt/yr of iron ore by December 2014. Vedanta held 100% interest in the WCL through its subsidiary Sesa Goa Ltd. The WCL included the Bea Mountain, the Bomi Hills, and the Mano River iron ore deposits, which are located between 70 and 140 km northwest of Monrovia. A Joint Ore Reserves Committee (JORC)-compliant study completed in 2012 confirmed reserves of 966 Mt of iron ore (Vedanta Resources plc., 2013, p. 61).

Mineral Fuels

Petroleum.—Liberia did not produce or refine petroleum and was dependent upon imports for its domestic petroleum requirements. Between 2000 and 2010, NOCAL hired TGS Nopec Geophysical Co. of the United States to carry out two-dimensional and three-dimensional seismic data surveys for most of Liberia's offshore petroleum acreage. This led to the establishment of Liberia's existing 30 concessionary blocks. Seventeen of these blocks are within the continental shelf to water depths of between 2,500 to 4,000 m, and 13 are ultra-deep blocks with water depths of as much as 4,500 m. Most of these blocks were open for exploration in 2013, and eight were under exploration contracts (National Oil Company of Liberia, 2013b, p. 16–17).

Concessionary areas under contract included Blocks LB–08 and LB–09, which were awarded to European Hydrocarbons Ltd. of the United Kingdom (100%) in 2008; Block LB–10, which was awarded to a consortium of Anadarko Petroleum Corp. of the United States (80%), Mitsubishi Corp. of Japan (10%), and Repsol S.A. of Spain (10%) in 2009; and Blocks LB–11 and LB–12, which were awarded to United States-based Chevron Corp. (45%) in joint venture with Oranto Petroleum Ltd. of Nigeria (30%), and Eni S.p.A. of Italy (25%) in 2007. Block LB–14 was also awarded to Chevron (45%), Oranto Petroleum Ltd. of Nigeria (30%) and Eni (25%) in 2009. Block LB–15 was awarded to the consortium of Anadarko (47.5%), Repsol (27.5%), and Tullow Oil plc of the United Kingdom (25%) in 2008 (National Oil Company of Liberia, 2013a).

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In March, 2013, Exxon Mobil Corp. of the United States (80%) in joint venture with Canadian Overseas Petroleum Ltd. (20%) signed a production-sharing contract with the Government for the exploration rights to Block LB–13 offshore Liberia. The joint venture paid $50 million as a signature bonus to the Government for the rights to the block, which were previously owned by Peppercoast Petroleum Ltd. of the United Kingdom (National Oil Company of Liberia, 2013a).

Outlook

Iron ore production in Liberia is expected to increase threefold to 15 Mt by 2015 and then to almost double again to 25 Mt by 2016. This upsurge in iron ore output will not only have the potential to further increase Government proceeds from the mineral sector, but could also benefit Liberia's economy as a whole as the iron ore industry could become a new source of direct and indirect employment. Although the development of the petroleum industry is still in its infant stage, the recent interest by multinational petroleum corporations in the sector suggests that a profitable hydrocarbon sector could be developed. The Government's decision to review the country's existing mining laws may cause uncertainty among investors and deter foreign direct investment in the mining sector in the short term. Ongoing projects to rehabilitate much of the country's dilapidated infrastructure and electrical power grid, however, are likely to enhance existing mineral sector projects and could serve as a catalyst to attract mining investment to the country once a sound legislative framework for minerals is in place.

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TABLE 1
LIBERIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2009	2010	2011	2012	2013
Cement, hydraulic[2]		70,584	71,733	80,594	121,592 r	181,829
Diamond[3, 4]	carats	28,368	26,591	41,932	41,985 r	44,334 [2]
Gold, mine output, Au content[2, 5]	kilograms	524	666	448	641	600 e
Iron ore:[6]						
Gross weight	thousand metric tons	--	--	1,300	3,300	4,698 [2]
Fe content[e]	do.	--	--	780	1,980	2,800
Sand		120,000	110,000	103,000	201,800 r	200,000 e
Stone, crushed[e, 7]		3,000	3,000	2,600	4,400	7,300

eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. rRevised. do. Ditto. -- Zero.

[1]Table includes data available through June 30, 2014.

[2]Reported by the Central Bank of Liberia.

[3]Production estimated to be approximately 60% gem quality.

[4]Reported by the Kimberley Process Certification Scheme.

[5]Production of gold in Liberia was by artisanal miners.

[6]Direct-shipping ore.

[7]Estimated based on cement production.

TABLE 2
LIBERIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Liberia Cement Corp. Ltd. (Scancem International ANS, 62%, and Government, 29%)	Monrovia	220
Diamond	Artisanal and small-scale mining	Various counties	NA
Gold	do.	do.	NA
Iron ore	ArcelorMittal (Liberia) Ltd. (ArcelorMittal, 70%)	Western Range Project, 300 kilometers northeast of Monrovia	4,100

do. Ditto. NA Not available.

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The Mineral Industry of Libya

By Mowafa Taib

Libya was the world's 17th-ranked country in terms of its area, which covers about 1.76 million square kilometers, and the 108th-ranked country in terms of its population, which was estimated to be 6.1 million inhabitants in 2013. Libya was Africa's leading country in terms of the size of its proven crude oil reserves, which were estimated by the Organization of the Petroleum Exporting Countries (OPEC) to be 48,363 million barrels in 2013. Globally, according to the BP Statistical Review of World Energy Statistics, Libya was the ninth-ranked country in terms of the volume of its crude oil reserves, which accounted for 2.9% of the world's total. The country also held 1.5 trillion cubic meters of natural gas reserves by the end of 2013, which accounted for 0.8% of the world's total. In 2013, Libya was Africa's fourth-ranked producer of crude oil and condensate after Nigeria, Angola, and Algeria; it was also the fourth-ranked producer of natural gas after Algeria, Nigeria, and Egypt, and it accounted for 0.4% of the world's total natural gas output. In 2013, Libya exported ammonia, crude oil, natural gas, refined petroleum products, methanol, sulfur, and urea. The country also produced modest quantities of cement, crude steel, direct-reduced iron (DRI), gypsum, lime, and salt for domestic consumption (table 1; BP p.l.c., 2014, p. 6, 8, 20, 22, 24; Organization of the Petroleum Exporting Countries, 2014, p. 8, 22; U.S. Central Intelligence Agency, 2014).

Minerals in the National Economy

Libya's economy continued to be highly dependent on petroleum earnings, and thus it remained vulnerable to external and internal shocks, such as changes in crude oil prices and disruptions in petroleum production and exports. Petroleum activities were estimated to contribute 65% of the country's gross domestic product (GDP) in current prices in 2012 (the latest year for which comprehensive information was available). According to International Monetary Fund estimates, Libya's real GDP decreased by 13.6% in 2013 following an increase of 104.5% in 2012 and a decrease of 62.1% in 2011. The sharp change in economic growth in 2013 was attributed to interruptions in crude oil and natural gas production in the second half of 2013 and the blockade of eastern ports by armed militia following the resumption of production and export operations in 2012. Consequently, the value of hydrocarbon sector activity decreased by 31.6% in 2013 compared with an increase of 211.4% in 2012 and a decrease of 16.0% in 2011. Hydrocarbon revenues accounted for 87% of the total Government revenue in 2013 compared with 95% in 2012 (Central Bank of Libya, 2014, p. 53; International Monetary Fund, 2014, p. 27).

The contribution of nonfuel mining and quarrying sector activities to the country's GDP has been insignificant; it was estimated to be 0.2% in 2011 and 0.3% in 2010. The value of the nonfuel mining and quarrying sector's activities was estimated to be $89 million[1] in 2012 compared with $81 million in 2011 and $194 million in 2010 (Central Bank of Libya, 2014, p. 48).

Government Policies and Programs

State-owned Al-Muassasah Al-Libiyah Lilnaft [National Oil Corp. (NOC)] played a dual role as a regulator and a production partner in the hydrocarbon sector. The Geologic Research and Mining Department (GRMD) of the Industrial Research Center (IRC), which is a Government agency under the Ministry of Industry, is responsible for carrying out chemical, geologic, and physical analyses; exploration and prospecting studies; geologic mapping; and field, geographical information systems (GIS), and remote sensing services. The IRC was established by decree No. 25 of 1970 to advance the country's industrial development. The GRMD became more active in recent years in identifying Libya's nonfuel mineral resources, conducting mineral exploration studies, and proposing potential mining methods (National Oil Corp., 2013; Industrial Research Center, 2014).

The National Mining Corp. (NMC) was created by Resolution No. 161 of 2007 to invest in the country's natural resources and minerals to ensure that national demand for minerals is met by domestic industries (where possible), and to attract foreign investment to the mining sector. The shareholders in the NMC include state-owned producers of cement and iron and steel as well as local banks and investment agencies. In 2013, the NMC was seeking to establish joint ventures with other companies to exploit the country's mineral resources, namely clays, granite, gypsum, iron ore, marble, and silica sand (National Mining Corp., 2013).

Law No. 2 of 1971 and its amendments regulate mining and quarrying activities in Libya; law No. 5 of 1997 regulates foreign investment in the nonoil sectors and assigns the NMC the authority to grant mining licenses, enter into investment contracts with companies, and collect revenue generated by mines and quarries. Petroleum law No. 25 of 1955, Petroleum Regulations Nos. 8 and 9, and the provisions of the regulations pertaining to production-sharing agreements between the Government and international oil companies govern the hydrocarbon sector operations in Libya. Collectively, these agreements are known as "5-year Exploration and Production-Sharing Agreement IV." Additionally, law No. 443 of 2006 also applies to international companies, including hydrocarbon and mineral production commodity companies that intend to operate in Libya. This legislation requires foreign companies to have a local partner (either state owned or private) that holds a minimum of a 35% share in any joint venture. A new law adopted by the Government in 2013 (the New Companies Law) allows foreign investors to own up to a 49% interest in new joint ventures. This law replaced law No. 103 of

[1]Where necessary, values have been converted from Libyan dinar (LYD) to U.S. dollars (US$) at an average rate of US$1.00=LYD0.79 for 2013.

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2012, which allowed foreign investors to own up to 65% of new joint ventures (African Development Bank, 2014, p. 6).

Production

Production of crude oil decreased by 35% in 2013 compared with that of 2012 owing to the blockade of oil terminals in eastern Libya by rebels and militia groups demanding greater regional autonomy. Petroleum output partially rebounded in 2012 following the stoppage in 2011 because of the conflict, which lasted for most of the year. Ammonia, methanol, refined petroleum products, and urea outputs increased significantly in 2013 compared with those of 2012 when operations were halted for most of the year. Ammonia, methanol, and urea production increased by 363%, 309%, and 7,267%, respectively, in 2013 compared with that of 2012, but remained well below prewar production levels. Crude steel output increased by 127%; and that of DRI, by 87%. Production of some industrial minerals, such as gypsum and lime, was estimated to have increased because of the resumption of construction activity, but no verifiable data were available. Production of sulfur as a byproduct of petroleum and natural gas decreased by 51% in 2013 compared with that of 2012 (table 1; Central Bank of Libya, 2014, p. 58; Midrex Technologies, Inc., 2014, p. 8).

Structure of the Mineral Industry

In 2013, the NOC was the full owner of nine oil and oil-related services companies, including Arabian Gulf Oil Co., Azzawiya Oil Refining Co., Brega Petroleum Marketing Co., Jwofe Oil Technology, National Oil Fields and Terminals Catering Co., National Oil Well Drilling and Workover Co., North Africa Geophysical Exploration Co., Ras Lanuf Oil and Gas Processing Co., and Sirte Oil Co. The NOC was also a partner in joint-venture oil and gas companies that were operating in Libya, including Akakus Oil Operations A.G. with Repsol YPF S.A. of Spain; Harouge Oil Operations Co. with Petro-Canada (a subsidiary of Suncor Energy Inc. of Canada); Mabruk Oil Operations with Total S.A. of France and Wintershall Holding GmbH of Switzerland; Mellitah Oil Co. with Eni S.p.A. of Italy; Waha Oil Co. with ConocoPhillips Co., Hess Corp., and Marathon Oil Corp. of the United States; Wintershall joint venture with Wintershall Holding GmbH; and Zuweitina Oil Co. with OMV A.G. of Austria (table 2; National Oil Corp., 2013; Central Bank of Libya, 2014, p. 35).

Twenty-eight international oil companies were working in Libya under exploration and production-sharing agreements that they had signed with the NOC. These companies included, in alphabetical order of their country of registration, Sonatrach S.p.A. of Algeria; Woodside Petroleum Ltd. of Australia; Petróleo Brasileiro S.A. of Brazil; Petro-Canada Libya Co. of Canada; Great Wall Drilling Co. (a subsidiary of China National Petroleum Corp.) of China; Total E&P Libye (a subsidiary of Total S.A.) of France; RWE Dea North Africa/Middle East GmbH and Wintershall Holding GmbH of Germany; Oil India Ltd. and ONGC Videsh Ltd. of India; Pertamina E & P Libya Ltd. Co. of Indonesia; Inpex Corp., Japan Petroleum Exploration Co. Ltd., and Nippon Oil Exploration Ltd. of Japan; Statoil ASA of Norway; OAO Gazprom and OAO Tatneft of Russia; Turkish Petroleum Overseas Co. (TPOC) of Turkey; BG Group and Royal Dutch Shell p.l.c. of the United Kingdom; and Amerada Hess Libya Exploration Ltd., Chevron Corp., ExxonMobil Libya Ltd., and Occidental Petroleum Corp. of the United States (National Oil Corp., 2013).

Government-owned Libyan Iron and Steel Co. (Lisco) was the country's main steelmaker and one of the top steelmaking companies in North Africa. Lisco produced crude steel, DRI, and semifinished and finished steel products at its plants in Misuratah (Misrata), which is located on the Mediterranean coast in northwestern Libya (Libyan Iron and Steel Co., 2014).

Mineral Trade

In 2013, Libya's hydrocarbon exports, which included crude oil, natural gas, and other petroleum products, decreased in both value and volume compared with those of 2012, when the country's hydrocarbon exports recovered much of the losses of 2011. The value of hydrocarbon exports decreased by 33% to $40.2 billion from $61.2 billion in 2012. The volume of crude oil exports decreased by 39% to 589,000 barrels per day (bbl/d) from about 962,000 bbl/d; natural gas exports decreased by 11% to 5.51 billion cubic meters from 6.22 billion cubic meters in 2012; and the volume of refined petroleum products exports increased by 90% to 76,000 bbl/d from 40,000 bbl/d in 2012. Most of Libya's crude oil production was exported to Europe, including Italy (which received 23% of Libya's exports, in terms of value), Germany (13%), France (10%), and the United Kingdom (5%). Libya exported natural gas to Italy by way of the Greensteam pipeline. The 540-kilometer (km)-long pipeline transported natural gas from the Mellitah gas and oil terminal on the Mediterranean Sea to Gela on the island of Sicily in Italy and had a maximum capacity to discharge 11 million cubic meters per year. Libya's crude oil prices decreased slightly in 2013 compared with those of 2012. The average price for Ess Sider crude decreased to $108.51 per barrel from $111.86 per barrel in 2012, and that of Brega crude decreased to $108.88 per barrel from $111.45 in 2012 (U.S. Energy Information Administration, 2013; Organization of the Petroleum Exporting Countries, 2014, p. 11, 82–83).

Commodity Review

Metals

Gold and Iron Ore.—A recent study by the GRMD provided updated information on the discovery of banded iron formations at the Arkenu and Al Uwaynat regions, and the potential for development of gold and iron ore mines. The two regions are located in southeastern Libya near the border with Egypt (Suwesi, 2014, p. 565). The NMC reaffirmed the existence of iron ore deposits at the Wadi As Shati in southwestern Libya, which is located about 900 km from the Mediterranean coast. These deposits had the potential to feed Lisco's steel complex in Misuratah, which has been importing its iron ore from such countries as Brazil. The Wadi As Shati deposit covers an area of 4,000 square kilometers (km^2) and holds more than 5 billion metric tons (Gt) of iron ore, including 900 million metric tons (Mt) of proven reserves at the Tharot

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lens, 750 Mt of probable reserves at the Arrwisa lens, and 500 Mt of probable reserves at the Ashkeda lens. The Wadi As Shati deposit includes one of the world's largest oolitic iron ore resources; it holds 1.52 Gt of iron ore grading 40% iron. Although the Government was interested in developing the Wadi As Shati iron ore deposits, foreign investment would likely be needed to develop the mine and construct the 900-km-long railway needed to transport the iron ore to Lisco's steel complex and to the Port of Tripoli. Technology to produce DRI from oolitic iron ores (such as the Hatch™-Ironstone chloride segregation process) would be required to reduce phosphorous impurities in the iron ore to acceptable levels (Hernandes and others, 2013; National Mining Corp., 2013).

Iron and Steel.—In 2013, Libya's DRI production, which was solely produced by Lisco, increased by 87% to 950,000 metric tons (t) from 508,000 t in 2012. Lisco's output of crude steel increased by 127% to 715,000 t from 315,000 t in 2012; hot-rolled products, by 65% to 150,179 t from 90,847 t in 2012; and concrete-reinforcing bar (rebar) and rods, by 96% to 516,345 t from 262,856 t in 2012. In 2013, the company began an expansion project to increase its capacity to produce finished steel products to 2.4 million metric tons per year (Mt/yr) from 1.6 Mt/yr. The project was expected to be completed in April 2015 (Libyan Iron and Steel Co., 2014; World Steel Association, 2014).

Industrial Minerals

Clay and Shale.—Libya's mineral resources of clays were estimated to be about 1 Gt, including 125 Mt and 875 Mt of proven and probable reserves, respectively. At least 13 locations throughout the country were identified by the NMC for potential production of clay that could be used in cement, porcelain pottery, pottery, and oilfield drilling (National Mining Corp., 2013).

Diatomite.—Diatomite reserves in the Al Hishah formation that could be mined by open pit were estimated to be 30 Mt. The Al Hishah formation, which covers about 45 km^2, is located south of Ajdabyia in north-central Libya in the Subkhat Ghuzayil depression of the eastern Sirt basin (Eldernawi and others, 2014, p. 851).

Gypsum.—Eighteen locations for gypsum deposits in the Bir Algnam formation were identified by the NMC in the Al Jabal Al Gharbi, the Awbari Benghazi, and the Gulf of Sirte regions. Gypsum resources at these locations were estimated to be 8.4 Mt with thicknesses of up to 350 meters. The company estimated that the Jefren deposit contains one of the world's highest concentrations of pure gypsum (up to 99.5% calcium sulfate) (National Mining Corp., 2013).

Nitrogen.—The Libyan Norwegian Fertilizer Co. (Lifeco) produced ammonia and urea fertilizers at its plant in the Marsa El Brega complex on the Mediterranean coast. Production, which was halted for most of 2011 owing to civil unrest, resumed partial operations in 2012, and continued operating throughout most of 2013. Lifeco halted production at the end of 2013 because of security concerns in the Marsa El Brega area. The company was a joint venture of Yara International ASA of Norway (50% interest) and NOC and Libyan Investment Authority (25% interest each) and had a production capacity of 2,200 metric tons per day (t/d) of liquid ammonia and 2,750 t/d of granular urea (Libyan Norwegian Fertilizer Co., 2014).

Silica.—The NMC promoted the silica sands deposits at sites in the North Idri region in southeastern Libya as potential sites for mining and development. The Shaybat site held 1.30 Mt of proven reserves and 1.22 Mt of probable reserves of silica sands and the Mominyat site held 389,000 t of proven reserves and 411,000 t of probable reserves of silica sands (National Mining Corp., 2013).

Mineral Fuels

Petroleum.—Crude oil output decreased by about 35% in 2013 compared with that of 2012. Subsequently, the daily average production of crude oil decreased to about 1 million barrels per day (Mbbl/d) from about 1.45 Mbbl/d in 2012. The number of crude-oil-producing wells in Libya decreased by 602 wells to 1,308 wells from 1,910 wells in 2012. The number of wells completed, including development and exploration wells, increased by 38 wells to 106 wells from 68 wells in 2012. Libya had 31 active oil rigs in 2013 compared with 23 rigs in 2012. Nine companies produced crude oil in Libya in 2013, including Akakus Oil Operations, which was responsible for 23.6% of the country's total production, followed by Arab Gulf Oil Co. (19.5%), Waha Oil Co. (19.4%), Mellitah Oil Co. (13.1%), Sirte Oil Co. (6.8%), Mabruk Oil Operations (6.0%), Harouge Oil Operations Co. (4.6%), Wintershall (4.5%), and Zuweitina Oil Co. (3.1%). Seven oil and gas discoveries were reported in Libya in 2013. These discoveries were expected to add 6,719 bbl/d and 1.2 million cubic meters per day of new capacity (Central Bank of Libya, 2014, p. 52–54; Organization of the Petroleum Exporting Countries, 2014, p. 25–27).

In July, Libya's oil sector was crippled by work-related protests, which later escalated into demands for autonomy in the Cyrenaica region of eastern Libya, and alleged corruption charges. The conflict led to the closure of oil terminals, loading ports, oilfields, and pipelines and caused security issues at oil installations in the central and eastern regions of Libya. Protests forced the complete or partial closing of oilfields linked to the ports. Owing to protests at ports and at some oilfields, crude oil production decreased to 1.0 Mbbl/d in July and to 228,000 bbl/d by December from 1.4 Mbbl/d in the first half of 2013. At the end of August, militia members blocked the pipelines that linked the El Sharara oilfield to the Zawiya petroleum export terminal and the El Feel field to the Mellitah petroleum export terminal in western Libya, forcing the shutdown of those fields. The country's production plunged to about 200,000 bbl/d during the second half of 2013 and continued at that level into April 2014 (U.S. Energy Information Administration, 2013; Economist, The, 2014; Nield, 2014).

Outlook

The outlook for the mineral industry of Libya remains positive despite the continued armed conflict following the fall of the Qaddafi Government in 2011. Production of mineral commodities, such as cement, crude oil, crude steel, and nitrogen fertilizer, is expected to increase to previous levels once

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the civil war is over. Libyan officials, engineers, geologists, and researchers appear to be determined to develop the country's vast and untapped mineral resources, including such metals as gold and iron ore and such industrial minerals as diatomite, gypsum, kaolin, marble, and silica sands (Eldernawi and others, 2014; Suwesi, 2014).

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TABLE 1
LIBYA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
METALS						
Iron and steel, metal:						
Direct-reduced iron[3]		1,097	1,270	165	508	950
Crude steel		914	825	100	315	715
INDUSTRIAL MINERALS						
Cement, hydraulic[e]		6,500	7,000	3,500	2,000 r	2,000
Gypsum[e]		250	250	125	150	200
Lime[e]		250	250	125	150	200
Nitrogen:						
N content of ammonia		530	580	71	78 r	359
N content of urea		358	414	53	3	221
Salt[e]		40	40	20	30	30
Sulfur, byproduct of petroleum and natural gas[e]		130	132	37 r	138 r	67
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	29,289	30,257	9,861	23,435	22,874
Dry	do.	15,900	16,814	7,855	18,118	18,463
Methanol		664	638	85	65 r	266
Petroleum:						
Crude	thousand 42-gallon barrels	602,980	605,535	174,835	550,785	360,620
Refinery products:						
Liquefied petroleum gas	do.	2,409	2,409	2,372	2,400	2,400 e
Gasoline	do.	6,424	5,913	4,855	5,242	5,463
Kerosene and jet fuel	do.	15,294	15,805	6,216	5,913 r	5,986
Naphtha	do.	20,336	20,196	5,332	11,149 r	12,604
Distillate fuel oil	do.	32,631	35,186	11,354	16,791	20,702
Residual fuel oil	do.	47,924	51,502	14,932	15,111 r	28,367
Other	do.	2,732	3,284	1,739	9,856 r	7,794
Total	do.	127,750	134,295	46,800	66,462 r	83,300

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto.

[1]Table includes data available through March 16, 2015.

[2]In addition to the commodities listed, a variety of clay, dolomite, limestone, sand, and crushed construction stone was produced, and natron (soda ash) may have been produced, but available information is inadequate to make reliable estimates of output. Natural gas liquids also were produced but were blended with crude petroleum and reported as part of that total.

[3]Includes hot-briquetted iron.

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TABLE 2
LIBYA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Joint Libyan Cement Co. (JLCC) [Libyan Manufacturing Joint Venture Co., 90%, and plant employees, 10%]	Benghazi	1,000
Do.		do.	El Fataih, Derna	1,000
Do.		do.	El Hawari	1,000
Do.		Arab Union Contracting Co.	Burj Cement 1 at Zliten	1,400
Do.		do.	Burj Cement 2 at Zliten	1,600
Do.		Alahliya Cement Co. [National Investment Co., 64.9%; Economic and Social Development Fund (ESDF), 32.8%; others, 2.3%]	Lubda	1,000
Do.		do.	Souk el Khamis	1,000
Do.		do.	Zliten	1,000
Do.		do.	El Margueb	300
Dolomite and lime		Libyan Iron and Steel Co. (Government, 100%)	Sedada quarry, east of Misuratah	88
Gypsum		Alahliya Cement Co.	Ghadames	100
Do.		do.	Souk el Khamis	9
Do.		Arab Union Contracting Co.	Burj Cement 1 at Zliten	35
Iron and steel:				
Iron:				
Direct-reduced (sponge iron)		Libyan Iron and Steel Co. (Government, 100%)	Misuratah	1,100
Hot-briquetted iron		do.	do.	650
Steel:				
Crude		do.	do.	1,241
Rolled:				
Bar and rod		do.	do.	800
Cold-rolled strip		do.	do.	140
Hot-rolled strip		do.	do.	580
Methanol		Sirte Oil Co. [National Oil Corp. (NOC), 100%]	Marsa El Brega	680
Natural gas:				
Dry	million cubic meters	Mellitah Oil Co. [National Oil Corp. (NOC), 50%, and Eni S.p.A., 50%]	Mellitah	10,000
Liquefied		Sirte Oil Co. [National Oil Corp. (NOC), 100%]	Mersa El Brega	700 [1]
Nitrogen:				
Ammonia		Libyan Norwegian Fertilizer Co. (Lifeco) [Yara International ASA, 50%; National Oil Corp. (NOC), 25%; Libyan Investment Authority, 25%]	do.	800
Urea		do.	do.	1,000
Petroleum:				
Crude	thousand 42-gallon barrels	Akakus Oil Operations A.G. [National Oil Corp. (NOC), 88%, and Repsol YPF S.A., 12%]	El Sharara (NC–115 and NC–186) oilfield	124,000 [2]
Do.	do.	Zuweitina Oil Co. [National Oil Corp. (NOC), 88%, and OMV A.G., 12%]	Oilfields include the Al Fedaa, the Al Hakeem, the Al Sabah, the Zella, 29C, 103A, 103B, 103C, and 103D	120,500
Do.	do.	Waha Oil Co. [National Oil Corp. (NOC), 59.2%, and ConocoPhillips Co., Marathon Oil Corp., and Hess Corp., 40.8%]	Oilfields include the Dahra, the Farigh, the Gialo, the Samah, and the Waha	107,800
Do.	do.	Arabian Gulf Oil Co. [National Oil Corp. (NOC), 100%]	Oilfields include the Sarir and the Nagoora Augila	107,500
Do.	do.	Sirte Oil Co. [National Oil Corp. (NOC), 100%]	Oilfields include the Assumud, the Attahadi, and the Raguba	73,000

See footnotes at end of table.

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TABLE 2—Continued
LIBYA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum—Continued:				
Crude—Continued	thousand 42-gallon barrels	Mellitah Oil Co. [National Oil Corp. (NOC), 50%, and Eni S.p.A., 50%]	Oilfields include the Bhar Essalam, the Bouri, the Bu Attifel, the El Feel, KK, NC–125, NC–169, NC–174, OO–82, the Rimal, UU–82, XX–82, and the Wafa	72,700 [2]
Do.	do.	Wintershall joint venture [National Oil Corp. (NOC), 51%, and Wintershall Holding GmbH, 49%]	Oilfields include the As-Sarah, the Hamid, the Jakhir, the Nakhla, and the Tauma	30,500
Do.	do.	Mabruk Oil Operations [National Oil Corp. (NOC), 73%; Total S.A., 20.25%; Wintershall Holding GmbH, 6.75%]	Mabruk oilfield	24,700
Do.	do.	Harouge Oil Operations Co. [National Oil Corp. (NOC), 88%, and Petro-Canada, 12%]	Oilfields include the Amal, the En Naga the Farigh, the Ghani, and the Tibisti	2,550
Refined	do.	Ras Lanuf Oil and Gas Processing Co. [National Oil Corp. (NOC), 100%]	Ras Lanuf	80,300
Do.	do.	Azzawiya Oil Refining Co. [National Oil Corp. (NOC), 100%]	Az Zawiya	43,800
Do.	do.	Arabian Gulf Oil Co. [National Oil Corp. (NOC), 100%]	Tobruk	7,300
Do.	do.	do.	Sarir	3,650
Do.	do.	National Oil Corp. (NOC)	Marsa el Brega	2,920
Sulfur		Mellitah Oil Co. [National Oil Corp. (NOC), 50%, and Eni S.p.A., 50%]	Mellitah	128

Do., do. Ditto.
[1]Liquefied natural gas production was suspended in 2011.
[2]Production from the El Feel and the El Sharara fields was stopped during 2013 and resumed in 2014.

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The Mineral Industry of Madagascar

By Thomas R. Yager

In 2013, Madagascar played a significant role in the world's production of cobalt, ilmenite, nickel, rutile, and zirconium. The country's share of world mine production of ilmenite amounted to about 4%; mined cobalt, 2%; and mined nickel, rutile, and zirconium, 1% each. Madgascar became a globally significant producer of cobalt and nickel for the first time in 2013. Other domestically significant minerals produced included chromite, gemstones, and ornamental stones. Madagascar was not a globally significant consumer of minerals in 2013; most or all the country's chromite, cobalt, gemstone, graphite, ilmenite, mica, nickel, rutile, and zircon production was exported (Bedinger, 2015a, b; Kuck, 2015; Shedd, 2015).

Minerals in the National Economy

Based on provisional data for 2013, the manufacturing sector accounted for 8.9% of the gross domestic product; the mining sector, 1.2%; and the construction materials sector, 0.3%. The value of output in the mining sector increased by 83% in 2012 and by 128% in 2013. In 2012 (the latest year for which data were available), employment in artisanal mining was estimated to be about 500,000 workers (Ministry of Economy and Planning, 2013, p. ix–x; World Bank Group, The, undated, p. 17).

Production

In 2013, the production of beryl increased by an estimated 369%; refined nickel, by 342%; refined cobalt, by 323%; mined cobalt, by an estimated 228%; mined nickel, by an estimated 225%; quartz, by an estimated 122%; graphite, by an estimated 49%, and amazonite, by an estimated 23%. Mica output decreased by an estimated 23%, and chromite, by an estimated 18%. Crude petroleum production started in 2013. Data on mineral production are in table 1.

Structure of the Mineral Industry

Most of Madagascar's mining and mineral processing operations were privately owned, including the gemstone, graphite, mineral sands, nickel, and salt mines and the cement plants. Artisanal miners produced gemstones, gold, and mica. State-owned Kraomita Malagasy S.A. (KRAOMA) was the country's only chromite producer. Table 2 lists major mineral industry facilities in Madagascar.

Commodity Review

Metals

Bauxite and Alumina.—Resources at the Manantenina project in southeastern Madagascar were estimated to be 10.1 million metric tons (Mt) of bauxite at a grade of 34.1% Al_2O_3. Aziana Ltd. of Australia engaged in drilling at Manantenina and acquired the Soanomeiny license near Manantenina in 2013 (Aziana Ltd., 2014, p. 13–14).

Chromium.—KRAOMA produced chromite from the Bemanevika Mine, which had an estimated remaining life of 7 years. The majority of KRAOMA's production was exported to China. Output was constrained by poor infrastructure; the company produced an estimated 91,000 metric tons (t) of chromite in 2013 compared with 111,500 t in 2012. Asia Thai Mining Ltd. of Thailand explored at its Beriana Chromite project in Mahajanga Province (Industrial Minerals, 2014).

Cobalt and Nickel.—Sherritt International Corp. of Canada and its joint-venture partners mined nickel-cobalt laterite deposits at Ambatovy. Lateritic slurry from the Ambatovy ore-processing plant was processed into mixed cobalt and nickel sulfides at a pressure-acid-leaching plant at Toamasina. The sulfide product was processed at a refinery with a capacity of 60,000 metric tons per year (t/yr) of refined nickel and 5,600 t/yr of refined cobalt (Sherritt International Corp., 2014, p. 8).

In 2013, production of nickel and cobalt in mixed sulfides amounted to 29,248 t compared with 8,973 t in 2012. Refined nickel production increased to 25,148 t in 2013 from 5,695 t in 2012, and refined cobalt, to 2,083 t from 493 t. Sherritt and its joint-venture partners planned to produce between 40,000 and 45,000 t of refined nickel in 2014; refined cobalt output was likely to be between 3,300 and 3,800 t. The life of the mine was estimated to be 29 years (Sherritt International Corp., 2014, p. 8, 38–39).

Copper and Gold.—Artisanal miners produced gold at Aziana's Alakamisy project. Drilling programs by Aziana revealed that gold deposits were too widely dispersed for a large-scale mine to be viable. Aziana also engaged in drilling and other exploration at the Anosivola copper-gold project in 2013 (Aziana Ltd., 2014, p. 3, 7–12).

Titanium and Zirconium.—QIT Madagascar Minerals SA (QMM) [QIT Fer et Titane of Canada (a subsidiary of Rio Tinto plc), 80%, and the Government of Madagascar, 20%] mined ilmenite, rutile, and zircon at Mandena in southeastern Madagascar. By 2013, QMM had planned to reach its full capacity of 750,000 t/yr of ilmenite and 60,000 t/yr of zirsill, which is composed of quartz, sillimanite, and zircon. The company, however, suspended production in November because of weak demand for titanium dioxide in world markets. At yearend, it was unclear when production would restart (Eisner, 2013, p. 36, 120; Cann, 2014).

World Titanium Resources Ltd. (WTR) of Australia planned to start production at the Ranobe Mine, which is part of the Toliara Sands project in southwest Madagascar, in the second half of 2014. The company planned to produce 407,000 t/yr of ilmenite and 43,000 t/yr of rutile and zircon concentrate over the estimated 21-year life of the mine. In March 2013, WTR signed a joint-venture agreement with Sichuan Lomon Titanium of China for the development of Ranobe. Sichuan Lomon

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withdrew from the agreement in August because of an internal dispute in WTR's management. At yearend, it was unclear when production would start (Cann, 2014; Lismore-Scott, 2014).

Industrial Minerals

Gemstones.—In recent years, Madagascar has produced a variety of gemstones that included aquamarine, emerald, and other types of beryl; demantoid, tsavorite, and other types of garnet; amethyst, citrine, and other types of quartz; and agate, amazonite, cordierite, jasper, labradorite; ruby, sapphire, and tourmaline. Most gemstones were exported prior to cutting and polishing.

National sapphire production was reported to be 2,606 kilograms in 2012. Sapphire and other gemstones including alexandrite, garnet, spinel, and zircon, were mined at Ilakaka and Sakaraha. In August 2012, between 10,000 and 20,000 miners were estimated to be involved in gemstone production near Ilakaka and Sakaraha, which included about 6,500 in the Taheza River Basin, about 2,500 in the Fiherenana River and Malio River Basins, between 500 and 1,000 in the Benahy River and Imaloto River Basins, and 300 in the Ilakaka River Basin. Most of the mining operations were artisanal in 2012; mechanized operations produced at Ankaboka, Ambinany, and at Amabrazy in the Ilakaka River Basin. The mechanized operations in the Benahy River Basin ceased between 2010 and 2012 (Ministry of Economy and Planning, 2013, p. 55; Pardieu, 2013).

EUROMAD S.A. and Marbres et Granits de Madagascar SARL (MAGRAMA), both of Italy, and SQNY International of India had royalty agreements with Malagasy Minerals Ltd. (MML) of Australia to mine labradorite from the anorthosite intrusives at Ianapera and Maniry. Norcross Madagascar Group of the United States mined agate, amazonite, amethyst, apatite, calcite, jasper, labradorite, rhodonite, rose quartz, and other quartz. In December 2010, Norcross was producing amazonite in the Amboasitra region at the rate of 20 metric tons per month (t/mo). By June 2013, the company had increased amazonite production and was producing beryl as a coproduct at the rate of 10 t/mo (Norcross Madagascar Group, 2010; 2013).

Graphite.—Madagascar's graphite production was limited in recent years by competition from Chinese producers, the depletion of near-surface deposits, high energy costs, and problems with infrastructure. At the beginning of 2013, Etablissements Gallois S.A. was the only remaining producer that regularly mined and exported graphite. The increase in graphite output to an estimated 4,300 t in 2013 from 2,885 t in 2012 was mostly attributable to Etablissements Gallois. National production was still far below the levels of the 1990s (National Institute of Statistics, 2000, p. 12; Syrett, 2012; Industrial Minerals, 2014).

In 2013, Graphmada Equity Pte Ltd. (Stratmin Global Resources plc of the United Kingdom, 100%) sold about 200 t of graphite from its new mine at the Loharno project, which had a capacity of nearly 2,200 t/yr. Stratmin planned to increase its capacity to 3,600 t/yr in 2014 by upgrading its processing plant and subsequently to 7,200 t/yr by adding another shift. Indicated resources at Loharno were estimated to be 421,000 t at a grade of 5.15% carbon and inferred resources, 5.23 Mt at a grade of 4.04% graphite (Chadwick, 2013; Industrial Minerals, 2014).

Societe Malagache du Graphite held a mining license for the Ambatomitamba Mine, which closed during the 2000s. The company planned to restart production at the rate of 1,500 t/yr of graphite initially before increasing production to 2,500 t/yr in the second phase and the mine's full capacity of 4,000 t/yr in the third phase. At yearend, it was unclear if mining had restarted (Industrial Minerals, 2014).

In February 2013, Energizer Resources Inc. of Canada estimated that resources at its Molo graphite deposit were 124 Mt at a grade of 6.34% graphite. Energizer completed a preliminary economic assessment on a new mine at Molo and planned to complete a feasibility study by the fourth quarter of 2013. Depending on favorable results of the study, Energizer could start construction at Molo in the second quarter of 2014 and mining by the fourth quarter of 2015. Production was likely to be 84,000 t/yr of graphite. By yearend, the completion of the feasibility study had been rescheduled for 2014 (Reed, 2013; Industrial Minerals, 2014).

MML engaged in sampling at the Ianapera and the Maniry projects in the second half of 2012 and the first half of 2013. The company hoped to identify a resource of more than 5 Mt at a grade of at least 15% graphite. Aziana engaged in channel sampling at Antanisoa and drilling at Belanitra in the second half of 2013 (Malagasy Minerals Ltd., 2013, p. 6–9; Aziana Ltd., 2014, p. 15–17).

Mica.—Societe des Mines d'Ampandandrava produced about 1,000 t/yr of mica from mines in southeastern Madagascar. Increased production between 2009 and 2012 probably was attributable to artisanal miners near Analamaria in the Anosy Region (Chamber of Commerce and Industry of Antananarivo, 2011).

Rare Earths.—In 2013, Tantalus Rare Earths AG of Germany was engaged in the construction of a pilot leaching plant at its TRE project on the Ampasindava Peninsula in northwestern Madagascar. In April, the company revised its resource estimate to 435 Mt at a grade of 0.08% rare-earth oxides, of which 19% was heavy rare earths. Tantalus planned to complete a prefeasibility study on a new mine at TRE in the first half of 2014 (Scholes, 2013, p. 12–13).

Mineral Fuels

Coal.—Lemur Resources Ltd. of Australia held the Ianapera, the Imaloto, and the Sakaraha projects in the northern part of the Greater Sakoa basin. In September, Lemur completed a scoping study on a new mine at Imaloto with positive results. In the first 9 years of the mine's life, the company could produce 410,000 t/yr of coal for use in a new coal-fired power station adjacent to the mine and 78,000 t/yr for export. In the remaining 10 years of the mine's life, production could be 530,000 t/yr for use in the power station and 990,000 t/yr for export. Resources at Imaloto were estimated to be 136 Mt. The development of the mine depended on favorable results of further studies (Lemur Resources Ltd., 2013).

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Petroleum.—In 2013, Madagascar Oil Ltd. of Bermuda started production at its pilot plant at the onshore Tsimiroro heavy oil project (located in Block 3104). By yearend, the company had produced more than 36,000 barrels of crude petroleum. Resources at Tsimiroro were estimated to be 1.7 billion barrels. Madagascar Oil planned to farm out Blocks 3105, 3106, and 3107 in 2014 (Madagascar Oil Ltd., 2014, p. 6–7, 9).

Outlook

In 2014, growth in the value of the mining sector from increased cobalt, graphite, and nickel production is likely to be offset by the suspension of ilmenite, rutile, and zircon mining. The mineral industry of Madagascar is likely to grow between 2015 and 2017 because of further potential increases in cobalt, graphite, and nickel production. Madagascar could become one of the world's leading graphite producers with the development of the Molo project. Further growth in the mineral industry could result from the development of coal, petroleum, and rare-earths projects. The development of the mineral industry will depend on world market conditions and domestic political stability.

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TABLE 1

MADAGASCAR: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010[e]	2011[e]	2012[e]	2013[e]
METALS						
Beryllium, beryl in quartz concentrates[e]	kilograms	12,000	12,000	12,000	16,000	75,000
Chromite, marketable output		133,000 [3]	134,500 [3]	66,700 [3]	111,500 [r,3]	91,000
Cobalt:						
Mine output, Co content		--	-- [r,4]	-- [r,4]	670 [r]	2,200
Refined		--	-- [4]	-- [4]	493 [4]	2,083 [4]
Gold, mine output, Au content[e,5]	kilograms	17 [r]	46 [r,4]	1 [r,4]	157 [r,4]	--
Nickel:						
Mine output, Ni content		--	-- [r,4]	-- [r,4]	8,300 [r]	27,000
Refined		--	-- [4]	-- [4]	5,695 [4]	25,148 [4]
INDUSTRIAL MINERALS						
Cement, hydraulic[e]		140,000 [r]	160,000 [r]	150,000 [r]	150,000 [r]	150,000
Gemstones:[e,6]						
Amethyst[7]	kilograms	19,000 [r]	90,000 [r]	90,000 [r]	90,000 [r]	90,000
Cordierite	do.	60	80	80	100 [r]	100
Emerald	do.	10 [3]	2	70 [r]	140 [r,3]	140
Garnet	do.	200	300	300	400 [r]	400
Ruby	do.	2 [3]	90	50 [r]	24 [r,3]	25
Sapphire	do.	428 [3]	2,300	2,500 [r]	2,606 [r,3]	2,600
Tourmaline[7]	do.	15,000 [r]	20,000 [r]	25,000 [r]	25,000 [r]	25,000
Graphite, all grades		3,437 [3]	3,783 [3]	3,573 [3]	2,885 [r,3]	4,300
Gypsum		156	127 [4]	130	130	130
Kaolin		90	259 [4]	260	260	260
Mica, phlogopite		358 [3]	2,069 [3]	3,411 [3]	12,532 [r,3]	9,600
Ornamental stones:[e,6]						
Agate	kilograms	50,000 [r]	80,000 [r]	100,000 [r]	100,000 [r]	100,000
Amazonite		--	120	180	220	270
Labradorite		4,100 [r]	4,600 [r]	5,700 [r]	6,700 [r]	6,700
Quartz		104 [3]	407 [3]	214 [3]	221 [r,3]	490
Salt, marine[e]		75,000	78,000 [r]	85,000	85,000	85,000
Stone:						
Granite		1,239 [3]	1,543 [r,3]	3,701 [r,3]	2,519 [r,3]	2,500
Limestone[e,8]		180,000 [r]	210,000 [r]	200,000 [r]	200,000 [r]	200,000
Marble		3 [3]	-- [3]	1 [r,3]	-- [3]	--
Other		2,445 [3]	670	-- [r]	-- [r]	-- [r]
Titanium:						
Ilmenite concentrate:						
Gross weight		160,000	287,000 [4]	464,000 [r,4]	529,790 [r,4]	560,000
TiO_2 content		96,000	172,000	278,000 [r]	318,000 [r]	340,000
Rutile concentrate		3,200 [e]	5,700	9,300 [r]	11,000 [r]	12,000
Zirconium, zircon concentrate		4,755	7,490 [4]	13,075 [4]	15,000 [r]	16,000
MINERAL FUELS AND RELATED MATERIALS						
Petroleum, crude	thousand 42-gallon barrels	2 [e]	-- [4]	-- [4]	-- [4]	36 [4]

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. -- Zero.

[1]Table includes data available through February 27, 2015.

[2]In addition to the commodities listed, crude construction materials (other clays and sand and gravel), ornamental stones in addition to those listed (apatite and rhodonite), industrial abrasives, and calcite presumably are produced, but available information is inadequate to make reliable estimates of output.

[3]Reported exports.

[4]Reported production.

[5]Does not include smuggled artisanal production, which is estimated to be from 1,000 to 2,000 kilograms per year.

[6]Does not include smuggled artisanal production.

[7]Includes both gem and ornamental quality.

[8]Cement producers only.

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TABLE 2
MADAGASCAR: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Madagascar Long Cimenterie (Maloci)	Plant at Ambohimanambola	360,000.
Do.		Holcim (Madagascar) S.A. (Holcim Group, 90%)	Plant at Ibity	160,000.
Chromium		Kraomita Malagasy S.A. (KRAOMA) (Government, 100%)	Mine at Bemanevika	200,000.[e]
Cobalt				
Mine		Ambatovy Minerals S.A. (Sherritt International Corp., 40%; Sumitomo Corp., 27.5%; Korea Resources Corp., 27.5%)	Mine at Ambatovy	6,500.[e]
Refined		do.	Refinery near Toamasina	5,600.
Gemstones:				
Rough:				
Amazonite		Norcross Madagascar Group (NMG)	Mine in Amboasitra region	270.[e]
Amethyst		do.	Mines at Ambatonrazaka	90.[e]
Aquamarine		Small-scale miners	Mine at Tsaramanga	NA.
Emerald	kilograms	Artisanal and small-scale miners	Mines at Mananjary	150.[e]
Garnet		do.	Mines at Antetezambato	NA.
Do.		do.	Mines at Behara	NA.
Labradorite		Marbres et Granits de Madagascar SARL (MAGRAMA) and EUROMAD S.A.	Mines at Ianapera and Maniry	3,000.[e]
Do.		SQNY International	do.	2,000.[e]
Do.		Norcross Madagascar Group (NMG)	Mines at Maniry	2,700.[e]
Quartz		do.	Mines at Ramaratina	NA.
Do.		Small-scale miners	Mine at Tsaramanga	NA.
Ruby	kilograms	Artisanal and small-scale miners	Mines at Andilamena and Vatomandry	100.[e]
Sapphire	do.	Various producers, including the following: Artisanal and small-scale miners Tany Hafa S.A. Nantin Ltd. and artisanal miners	Locations: Mines at Ilakaka, Manombe, Marosely, and Sakara Mines at Sahambano Mines at Ankazoabo	2,600.[e]
Tourmaline	do.	Artisanal and small-scale miners	Mines at Alatsinainuy Ibity	NA.
Polished[1]	do.	Dream Stones Trading	Plant in Antananarivo	15.
Graphite		Etablissements Gallois S.A.	Artsirakambo Mine near Brickaville	4,800.
Do.		do.	Marovinsty Mine near Vatomandry	3,600.
Do.		do.	Ambalafotaka Mine	NA.
Do.		Graphmada Equity Pte Ltd.	Mines at Antsirabe and Loharano	2,200.[e]
Do.		do.	Plant at Loharano	2,200.
Gypsum		Compagnie Salinere de Madagascar	Antsahampano	500.
Mica		Societe des Mines d'Ampandandrava (SOMIDA)	Mines in Anosy Region	1,000.
Do.		Artisanal and small-scale miners	do.	NA.
Nickel				
Mine		Ambatovy Minerals S.A.	Mine at Ambatovy	60,000.[e]
Refined		do.	Refinery near Toamasina	60,000.
Petroleum, crude	thousand 42-gallon barrels	Madagascar Oil Ltd.	Tsimiroro[2]	90.[e]
Salt		Compagnie Salinere de Madagascar	Antsahampano	80,000.
Titanium minerals		QIT Madagascar Minerals S.A. [QIT Fer et Titane of Canada (a subsidiary of Rio Tinto plc), 80%, and Government, 20%]	Mine at Mandena[2]	750,000 ilmenite; 15,000 rutile.
Zirconium		do.	do.	40,000 zircon.

[e]Estimated. Do., do. Ditto. NA Not available.

[1]Includes amethyst, aquamarine, emerald, sapphire, tourmaline, and other gemstones.

[2]Not operating at the end of 2013.

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The Mineral Industry of Malawi

By Thomas R. Yager

Malawi was a producer of brick clay, cement, coal, crushed stone, lime, limestone, and sulfuric acid for domestic consumption in 2013; Malawi's consumption of minerals and mineral fuels, however, was not globally or regionally significant. The country also mined and exported uranium; such gemstones as amethyst, garnet, ruby, sapphire, and tourmaline; and such ornamental stones as agate and rose quartz. Malawi accounted for nearly 2% of world uranium mine production in 2013 (World Nuclear Association, 2014).

In 2013, the manufacturing sector accounted for a projected 9.4% of the gross domestic product (GDP), and the mining and quarrying sector, 5.2%. The value of output in the mining and quarrying sector was projected to increase by 8.5% in real terms in 2013 compared with 14.6% in 2012. Growth in the mining and quarrying sector was likely to be attributable to demand from the domestic agricultural, construction, and manufacturing sectors (Reserve Bank of Malawi, 2013, p. 22, 24, 60).

The mining sector accounted for only 0.8% of the GDP in 2009. In 2010, the value of output increased by 524.8% because of increased production from the Kayelekera uranium mine. The growth in the mining sector accounted for 45% of all GDP growth in Malawi in 2010 (Reserve Bank of Malawi, 2013, p. 60).

Production

In 2013, limestone production for use in cement increased by an estimated 362%; cement, by an estimated 86%; and lime, by an estimated 20%. Bentonite and dimension stone production shut down in 2012 (table 1).

Structure of the Mineral Industry

Most of the mining and mineral processing operations in Malawi were privately owned, including the cement plants, the coal mines, the Kayelekera uranium mine, and the Nyala ruby and sapphire mine. Malawi's mineral industry also included numerous artisanal and small-scale mining operations that produced aggregates, brick clay, gemstones, and lime. Partial data on capacity, location, and ownership were available for artisanal and small-scale gemstone and lime operations (table 2).

In 2010 (the latest year for which data were available), employment in the mineral industry amounted to 21,022 workers. The aggregates subsector employed 12,030 Malawians; lime, 1,640; terrazzo, 1,340; gemstones, 1,260; coal, 907; and uranium, 859 (Ministry of Development, Planning and Cooperation, 2011, p. 41).

Commodity Review

Metals

Gold.—In early 2013, South East African Mining Ltd. (SEAM) of the United Kingdom engaged in drilling at its South Dwangwa property. SEAM's initial focus was on the Kadyalumba Hill and the Kamwala-Mtenhela prospects (Murray, 2013).

Iron Ore.—Britannia Mining Inc. of the United States explored for iron ore at Mphwamphwa in northern Malawi and at Nthale and Ntechu in southern Malawi. The company hoped to identify 100 million metric tons (Mt) of iron ore resources at Nthale (Britannia Mining Inc., 2013).

Niobium (Columbium) and Tantalum.—Globe Metals & Mining Ltd. of Australia (East China Mineral Exploration and Development Bureau, 51%) revised its resource estimate at the Kanyika pyrochlore deposit in early 2013. Resources were estimated to be 68.3 Mt at grades of 0.28% niobium pentoxide (Nb_2O_5), 0.014% tantalum pentoxide (Ta_2O_5), and 0.008% U_3O_8 (uranium oxide). Globe also completed a feasibility study on a new mine at Kanyika in the second quarter of 2013 (Globe Metals & Mining Ltd., 2013; Jockel, 2013, p. 11).

Depending on results of the study, Globe planned to produce 5,000 metric tons per year (t/yr) of Nb_2O_5 and 200 t/yr of Ta_2O_5; uranium and zircon concentrate from the mine would be stockpiled for future sale. The company determined that an optimization program to increase concentrate grades and a study on a smelting process to produce ferroniobium were necessary (Globe Metals & Mining Ltd., 2013; Jockel, 2013, p. 11).

Titanium and Zirconium.—Tengani Titanium Minerals Ltd. (TTM), which was a consortium of Malawian and South African investors, held a mining license for the Tengani ilmenite, rutile, and zircon deposit. The company was engaged in a prefeasibility study on a new mine with an estimated life of more than 20 years. In 2013, TTM indicated that difficulties in separating ilmenite and rutile from each other and low recovery rates because of dilution by other minerals, such as garnet, would delay the project (Chimwala, 2013).

Industrial Minerals

Cement.—Malawi had three cement plants with a total production capacity of 740,000 t/yr. In 2013, national cement production increased to about 320,000 metric tons (t) from 172,000 t in 2012. Cement Products Ltd. opened a new plant at Njereza with a capacity of 460,000 t/yr in December 2012. Portland Cement Company Ltd. (LaFarge S.A., 75.17%) operated a plant with a capacity of 200,000 t/yr that produced cement from imported clinker. Shayona Cement Corp.'s plant had a capacity of 80,000 t/yr; the company planned to complete a new plant at Wimbe with a capacity of about 360,000 t/yr by 2015. National cement consumption was estimated to be 370,000 t in 2012 compared with 340,000 t in 2011 (International Cement Review, 2013).

Gemstones.—Mzimba Gemstone Mining Cooperative Society Ltd. mined amethyst and other quartz, aquamarine, carnelian, garnet, sodalite, and tourmaline from pegmatites in northern Malawi; the majority of production took place in

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Mzimba District. Artisanal miners were producing rose quartz at the rate of 56 t/yr at Mzimba in 2013. Silver Hill Gems of South Africa mined amethyst and Aquismart (Pty) Ltd. of South Africa engaged in bulk sampling for aquamarine near Mzimba in November. Nyala Mines Ltd. operated the Nyala ruby and sapphire mine (Integrated Regional Information Networks, 2013).

Graphite.—In 2013, Sovereign Metals Ltd. of Australia engaged in rock-chip sampling and trenching at the Central Malawi graphite project near Lilongwe. Globe engaged in rock-chip and stream-sediment sampling at the Chiziro project, which is located east of Lilongwe. Globe planned to initiate trenching at Chiziro in the first quarter of 2014 (Globe Metals & Mining Ltd., 2013, 2014).

Rare Earths.—In 2013, Mkango Resources Ltd. of Canada was engaged in a prefeasibility study on a new mine at the Songwe Hill rare-earth project in southern Malawi; the company planned to complete the study in early 2014. Resources at Songwe were 31.8 Mt at a grade of 1.48% rare-earth oxides. In the fourth quarter of 2013, Globe engaged in soil sampling at the Machinga property near Kasupe, which was prospective for niobium, tantalum, and rare-earth minerals that include heavy rare earths. At yearend, Globe was awaiting Government approval for the renewal of its license at Machinga (Mkango Resources Ltd., 2013; Globe Metals and Mining Ltd., 2014).

Spring Stone Ltd. (Japan Oil, Gas, and Metals National Corp., 67%, and Gold Canyon Resources Inc. of Canada, 33%) deferred exploration at its Mulanje property in southern Malawi after determining that deposits at Chambe Basin would be subeconomic because of their small size. The company also decided not to renew its prospecting license for Mangochi (Gold Canyon Resources Inc., 2014).

Lynas Corp. Ltd. of Australia was engaged in a dispute with Rift Valley Resource Development of South Africa concerning the ownership of the Kangankunde deposit, which is located southwest of Balaka. As of mid-2013, the project was on hold pending resolution of the ownership dispute (Lynas Corp. Ltd., 2013).

Mineral Fuels and Related Materials

Coal.—Bituminous coal was mined by four companies in 2013. Eland Coal Mining Co. increased its production capacity by 150%. Intra Energy Corp. (IEC) of Australia purchased a 90% share in the Nkhachira Mine in early 2013. The company planned to mine at the initial rate of 60,000 t/yr of coal and to subsequently increase production to 150,000 t/yr (Murray, 2013; Saunders, 2013).

Coal output was consumed by Malawi's brewing, cement, ethanol, sugar, tea, textile, and tobacco industries. Domestic industrial demand for coal was estimated to be between 120,000 and 150,000 t/yr (Saunders, 2013).

Malawi's power stations had a combined capacity of 300 megawatts (MW), most of which was hydropower. Only 160 MW of capacity was functional in 2013 because of aquatic weeds and river siltation. In August 2012, China Gezhouba Group Corp. signed an agreement with the Government to build a new coal-fired power station with a capacity of 1,000 MW. The company planned to start construction in 2013 and to complete the plant by 2015 at an estimated cost of $500 million. Construction on the plant, however, had not started by yearend. IEC was engaged in a feasibility study on a new coal-fired power station with a capacity of 120 MW. Depending on the results of the study, IEC could open the new Pamodzi power station starting in 2017; coal would be provided by IEC's mines in Malawi and Tanzania (Africa Project Newsletter, 2013; Moodley, 2013; Saunders, 2013).

Uranium.—Paladin Energy Ltd. opened Malawi's first uranium mine at Kayelekera in the northern part of the country in January 2009. In 2013, production was 1,335 t of U_3O_8, which was an increase of about 3% from that of 2012. Paladin commissioned a new acid recovery plant in December. The Kayelekera Mine's capacity was 1,500 t/yr of U_3O_8; Paladin was considering an increase in capacity to more than 1,700 t/yr by 2015. The expansion depended on increased uranium prices (Northern Miner, 2013; Paladin Energy Ltd., 2014).

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TABLE 1
MALAWI: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013[e]
Bentonite		8,050	2,100	2,450	--	--
Brick clay		NA	960,405	1,015,200	1,400,000 [e]	1,500,000
Cement, hydraulic		232,000	187,500	203,200	172,000 [r]	320,000
Coal, bituminous		59,201	65,006	72,300	91,910	98,000
Gemstones	kilograms	306,700	190,340	215,000	285,000	310,000
Lime		25,900	45,851	93,549	95,543	115,000
Ornamental stone		241	5,300	4,434	7,200	7,800
Stone:						
Crushed for aggregate		970,550	965,600	1,039,237	1,338,600	1,450,000
Dimension:						
Crude and partly worked		NA	201	277	--	--
Worked		NA	116	167	--	--
Limestone, for cement		47,150	27,122	33,701 [r]	41,150	190,000
Sulfuric acid[e]		6,400 [r]	37,000 [r]	56,000 [r]	73,000 [r]	75,000
Uranium, U_3O_8 content		115	790	998	1,298	1,335 [3]

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. NA Not available. -- Zero.

[1]Table includes data available through June 27, 2014.

[2]Malawi reportedly produced modest quantities of gypsum and salt, but information is inadequate to make reliable estimates of output.

[3]Reported data.

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TABLE 2
MALAWI: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Cement Products Ltd.	Plant at Njereza	460,000.
Do.	Portland Cement Company Ltd. (Lafarge S.A., 75.17%)	Plant at Blantyre	200,000.
Do.	Shayona Cement Corp.	Plant at Livwezi	80,000.
Coal, bituminous	Mchenga Coal Mines Ltd. (subsidiary of Coal Products Ltd.)	Mchenga Mine in Rumphi District	90,000.
Do.	Eland Coal Mining Co. (subsidiary of Allied Procurement Agency)	Mine at Lufira coalfield	72,000.[e]
Do.	Intra Energy Corp. (IEC)	Nkhachira Mine near Kayelekera	60,000.
Do.	Kaziwiziwi Mining Co.	Mine at Kaziwiziwi	5,000.[e]
Dimension stone	Ilomba Granite Company Ltd.	Mine at Ilomba Hill in Chitipa District[1]	NA.
Do.	Granite Ltd.	Mine in Mzimba District[1]	NA.
Fertilizer	Optichem Ltd.	Plant at Blantyre	120,000.
Gemstones:			
Amethyst, aquamarine, garnet, and tourmaline	Mzimba Gemstone Mining Cooperative Society Ltd.	Mines in Mzimba District	NA.
Aquamarine kilograms	Silver Hill Gems	NA	7,000.[e]
Quartz, rose	Artisanal miners	Mine near Mzimba	56.[e]
Ruby and sapphire kilograms	Nyala Mines Ltd. (subsidiary of Columbia Gem House Inc.)	Nyala Mine at Chimwadzulu Hill	300 sapphire; 150 ruby.[e]
Lime	Various producers, including the following: Zalewa Agricultural Lime Co. LimeCo Balaka Limeworks Supply Co. Ltd.	Various sites, including the following: Blantyre NA Balaka	42,000.
Do.	Lirangwe Lime Makers Assoc.	Lirangwe	NA.
Do.	Balaka Lime Makers Assoc.	Balaka	NA.
Limestone	Shayona Cement Corp.	Mine at Wimbe	100,000.[e]
Do.	Cement Products Ltd.	Mine at Njereza	45,000.
Do.	Artisanal miners	do.	NA.
Sulfuric acid	Paladin Energy Ltd.	Plant near Kayelekera	84,000.
Uranium, U_3O_8	do.	Mine near Kayelekera	1,500.

[e]Estimated. Do., do. Ditto. NA Not available.
[1]Not in operation at the end of 2013.

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The Mineral Industries of Mali and Niger

By Omayra Bermúdez-Lugo

MALI

In June 2013, Mali's interim Government and the country's Tuareg rebel groups signed a preliminary peace agreement in Ouagadougou, the capital city of Burkina Faso. The peace agreement led to democratic presidential elections in Mali in July 2013, and legislative elections in November and December (Diallo and Diarra, 2013; Kerry, 2013, Psaki, 2013). Mali's political stability had been threatened in April 2012 when Tuareg rebels carried out a military coup that resulted in the dissolution of the Government and the internal displacement of more than 100,000 people. Although industrial gold mining operations in the west and southwest of the country were not affected by the coup, gold, manganese, iron ore, and phosphate rock exploration activities were temporarily suspended; these exploration activities, however, resumed in 2013 (Nossiter, 2012; United Nations High Commissioner for Refugees, 2012).

Mali's economy continued to be largely dependent on gold exports, which historically have accounted for the majority of the country's total export earnings from mining. In addition, to gold, Mali was estimated to also produce about 20,000 t of phosphate rock. Diamond, iron ore, rock salt, sand and gravel, silver as a byproduct of gold mining, and colored gemstones (such as amethyst, epidote, garnet, prehnite, and varieties of quartz) were also produced, but information was inadequate to make reliable estimates of output. In 2013, gold produced from industrial mining operations decreased to 40,803 kilograms (kg) from 41,016 kg in 2012; artisanal miners were estimated to have produced more than 6,000 kg of gold during 2013.

Industrial gold production came from seven mines. Production from the Syama Mine increased by about 35% to 5,513 kg of gold in 2013, mostly as a result of increased throughput and higher ore grades. Production from the Tabakoto Mine increased by 13.5% to 3,895 kg of gold, mostly as a result of the completion of the Tabakoto mill expansion program. Gold production from the Kalana Mine increased slightly to 317 kg in 2013 from 314 kg in 2012. At the Loulo-Gounkoto Mine, higher throughput, resulting from the commissioning of a third mill in 2012, resulted in a 30% increase in output to 18,051 kg of gold in 2013 from 15,652 kg in 2012. Gold production from the Morila Mine's stockpile decreased by 30% to 4,411 kg; Morila Mine's main ore body was depleted in 2009 and the only ore being processed was that of stockpiled material, which was also expected to be depleted by 2017. Gold production also decreased at the Sadiola Hill and Yatela Mines. Production from the Sadiola Hill Mine decreased by about 14% to 6,532 kg, and that of the Yatela Mine, by about 7% to 2,084 kg. Mining activities at the Yatela Mine were suspended on September 30 partly as a result of the decrease in the spot price of gold (AngloGold Ashanti Ltd., 2014a, p. 33; 2014b; Avnel Gold Mining Ltd., 2014, p. 20; Endeavour Mining Corp., 2014, p. 7, 16; IAMGOLD Corp., 2014, p. 15, 63; Randgold Resources Ltd., 2014, p. 23, 33; Resolute Mining Ltd., 2014, p. 9–10).

Table 1 provides data on the principal mineral commodities produced in Mali from 2009 to 2013, and table 2 provides a list of major mineral industry facilities in 2013. More-extensive coverage of the mineral sector of Mali can be found in the 2011 and 2012 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available at http://minerals.usgs.gov/minerals/pubs/country/africa.html#ml).

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NIGER

In 2013, Niger was the world's fourth-ranked producer of uranium by tonnage. Niger's uranium industry continued to be

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affected by political instability in the West Africa region. On May 23, 2013, at least 14 employees at Société des Mines de l'Aïr (SOMAIR), a subsidiary of Areva Group of France, were injured and one was killed after a suicide bomb attack was carried out at Areva Group's concession facilities. Although uranium ore extraction resumed at SOMAIR's facility on May 24, ore processing was not fully operational until August. The SOMAIR facilities were located near Arlit in the Agadez region in northeastern Niger. Other mineral commodities produced in the country included cement, coal, gold, gypsum, limestone, petroleum, petroleum refinery products, salt, silver, and tin (Areva Group, 2013a–c; BBC News, 2013; World Nuclear Association, 2014).

On December 2, Semafo Inc. of Canada sold its 80% interest in the Samira Hill Mine to Government-owned Société de Patrimoine des Mines du Niger S.A. (SOPAMIN). The Samira Hill Mine was the only industrial gold mining operation in the country. Production in 2013 was about 960 kg of gold (Semafo Inc., 2014, p. 20).

Table 1 provides data on the principal mineral commodities produced in Niger from 2009 through 2013, and table 2 provides a list of major mineral industry facilities in 2013. More-extensive coverage of the mineral sector of Niger can be found in the 2011 and 2012 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available at http://minerals.usgs.gov/minerals/pubs/country/africa.html#ng.

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TABLE 1
MALI AND NIGER: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity		2009	2010	2011	2012	2013
MALI[2]						
Gold, mine output, Au content[3]	kilograms	42,731 r	38,563 r	38,208 r	41,016 r	40,803
Phosphate rock		--	1,600 e	18,000 e	20,000 e	20,000 e
NIGER[4]						
Cement, hydraulic		41,848	32,008	72,510	72,500	70,000 e
Coal, bituminous		225,072	246,558	246,016	235,072	241,792
Gold, mine output, Au content[5]	kilograms	1,985	1,950	1,957	1,662	1,150
Gypsum		19,737	7,559	6,058	600 r	--
Limestone		29,691	23,152	-- r	-- r	--
Salt[e]		30,000	30,000	30,000	30,000	30,000
Silver, mine output, Ag content	kilograms	256	326	197	329	300 e
Petroleum:						
Crude[6]	thousand 42-gallon barrels	--	--	680 r	4,642 r	6,498
Refinery products[6]	do.	--	--	459	4,550	6,335
Tin, mine output, Sn content[7]		6	6	10	-- r	--
Uranium, U_3O_8 content[8]		3,800 r	4,900 r	5,100 r	5,500 r	5,300

eEstimated; estimated data are rounded to no more than three significant digits. rRevised. -- Zero.

[1]Table includes data available through December 31, 2014.

[2]In addition to the commodities listed, Mali also produced diamond, iron ore, salt, sand and gravel, silver as a byproduct of gold mining, and colored gemstones (amethyst, epidote, garnet, prehnite, and varieties of quartz), but information is inadequate to make reliable estimates of output.

[3]Excludes artisanal gold production, which was estimated to be more than 5,000 kilograms (kg) in 2009 and 2010 and more than 6,000 kg from 2011 through 2013.

[4]In addition to the commodities listed, Niger also produced phosphate rock, sulfuric acid produced from imported sulfur, tungsten ore, and a variety of construction materials (clays, sand and gravel, and stone), but information is inadequate to make reliable estimates of output.

[5]Includes artisanal and small-scale production of gold, which averaged 267 kilograms per year from 2008 to 2012.

[6]Reported by Institut National de la Statistique.

[7]Production of tin was by artisanal miners.

[8]Series revised to U_3O_8 content from U content to reflect the standard unit of trade used in the nuclear energy business.

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TABLE 2
MALI AND NIGER: STRUCTURE OF THE MINERAL INDUSTRIES IN 2013

(Metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
MALI				
Gold	kilograms	Artisanal miners	Kenieba Valley	5,000
Do.	do.	Endeavour Mining Corp., 80%; Government, 20%	Tabakoto Mine, Kenieba Valley	4,600
Do.	do.	Morila Ltd. (AngloGold Ashanti Ltd., 40%; Randgold Resources Ltd., 40%; Government, 20%)	Morila Mine, 280 km southeast of Bamako	4,500
Do.	do.	Sadiola Exploration Company Ltd. (AngloGold Ashanti Ltd., 40%; IAMGOLD Corp., 40%; Government, 20%)	Yatela Mine,[2] 50 km southwest of Kayes	2,100
Do.	do.	Société d'Éxploitation des Mines d'Or de Sadiola S.A. (AngloGold Ashanti Ltd., 41%; IAMGOLD Corp., 41%; Government, 18%)	Sadiola Hill Mine, 77 km south of Kayes	7,000
Do.	do.	Société d'Éxploitation des Mines d'Or de Kalana S.A. (Avnel Gold Mining Ltd., 80%, and Government, 20%)	Kalana Mine, 300 km south of Bamako	900
Do.	do.	Société des Mines de Loulo S.A. (Somilo) (Randgold Resources Ltd., 80%, and Government, 20%)	Loulo-Gounkoto Mine complex, 350 km west of Bamako	21,000
Do.	do.	Société des Mines de Syama S.A. (Resolute Mining Ltd., 80%, and Government, 20%)	Syama Mine, 300 km southeast of Bamako	7,800
Phosphate rock		Toguna S.A. (Toguna Groupe, 100%)	Tilemsi, northern Mali	140,000
NIGER				
Cement		Société Nigérienne de Cimenterie (Damnaz Cement Company Ltd.)	Malbaza Uzine, southwestern Niger	80,000
Coal		Société Nigérienne de Charbon (SONICHAR)	Anou Araren, central Agadez region	300,000
Gold	kilograms	Société de Patrimoine des Mines du Niger S.A. (SOPAMIN), 80%, and Government, 20%	Samira Hill Mine, 90 km west of Niamey	3,000
Petroleum	thousand 42-gallon barrels per day	China National Petroleum Corp., 60%, and Government, 40%	Agadem oilfields	20,000
Petroleum refinery products	do.	China National Petroleum Corp., 60%, and Government, 40%	Soraz refinery, city of Zinder, 900 km east of Niamey	20,000
Salt		Artisanal mining	Bilma salt pans, Tenere Desert, northern Niger	33,000
Uranium		Compagnie Minière d'Akouta (COMINAK) [Areva Group, 34%; Government, 31%; Overseas Uranium Resources Development Co., 25%; ENUSA Industrias Avanzadas S.A., 10%]	Akouta underground mine, northern Niger	2,000
Do.		Société des Mines de l'Aïr (SOMAIR) (Areva Group, 63.4%, and Government, 36.6%)	Arlit open pit mine, 6 km northwest of Arlit, Agadez region	3,000
Do.		Société des Mines d'Azelik S.A.	Azelik Mine	700

Do. do. Ditto.

[1]Abbreviations used for units of measure are as follows: km, kilometer.

[2]The Yatela Mine closed in September 2013.

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The Mineral Industry of Mauritania

By Mowafa Taib

Mauritania occupies an area of more than 1 million square kilometers (km²) in northwest Africa and has a population of 3.5 million. The country was a supplier of crude oil, copper, gold, and iron ore in 2013. Mauritania was the 2d-ranked exporter and producer of iron ore in Africa after South Africa, and it was the world's 11th- and 15th-ranked exporter and producer of iron ore, respectively. In addition to copper, gold, and iron ore, Mauritania produced modest quantities of cement, crude oil, gypsum, quartz, salt, and steel (table 1; U.S. Central Intelligence Agency, 2014; World Steel Association, 2014, p. 102–103).

Minerals in the National Economy

In 2013, Mauritania's gross domestic product (GDP) increased in real terms by 6.7% to about $4.2 billion compared with a revised rate of 7.0% in 2012, which was nearly double the revised growth rate of 4.0% in 2011. The growth rate of the mineral sector, which included crude oil and metal production, increased to 16.2% in 2013 from -1.6% in 2012. Crude oil production increased at a rate of 3.2% in 2013 compared with a decrease of 15.9% in 2012. The growth rates of copper, gold, and iron ore were 12.7%, 20.2%, and 16.9%, respectively, in 2013 compared with a decrease of 19.2% and 5.0% and an increase of 2.6%, respectively, in 2012. The contribution of the mining sector to the GDP decreased to 29.3% in 2013 from 31.2% in 2012 and 38.1% in 2011. The value of metal sector activity, which contributed 25.2% of the GDP, increased by 17.2% in real terms in 2013 compared with a decrease of 0.3% in 2012. The increase was the result of increased production of gold and iron ore in 2013 compared with those of 2012. The value of petroleum sector activity, which contributed 2.4% to the GDP, increased slightly (by 1.7%) in 2013. The increase was attributed to the increased production of crude oil to 2.5 million barrels (Mbbl) from 2.4 Mbbl in 2012 (Banque Centrale de Mauritanie, 2014, p. 28–31, 101, 103).

The flow of foreign direct investment (FDI) to Mauritania continued in 2013 but at a reduced rate compared with the historic surge of 2012. The value of FDI influx to Mauritania in 2013 was $1.15 billion, which was about 17% less than that of 2012, which was $1.383 billion. Most of the FDI was used to expand mining projects. The value of greenfield FDI projects in Mauritania, however, decreased to $23 million in 2013 from $361 million in 2012 and $279 million in 2011 (United Nations Conference on Trade and Development, 2014, p. 40, 205, 219).

Government Policies and Programs

The Ministère de l'Industrie et des Mines [Ministry of Industry and Mines] is the Government agency responsible for regulating the country's mining industry activity. The Direction des Mines et de la Géologie [Department of Mines and Geology] implements the Government's policies to enhance foreign investment in the mining sector of Mauritania. The Code Minier [Mining Law] awards exploration permits on a "first come, first served" basis for a 3-year period that can be renewed twice for up to 3 years each time. Mining licenses are awarded for a 30-year period and are renewable for up to 10 additional years. The law exempts mining companies from customs duties for equipment during exploration and the first 5 years of production and permanently on fuel and spare parts. The tax code includes a 25% corporate income tax rate after a tax exemption for the first 3 years of production, a tax withholding rate of 14% on repatriated earnings, and a 16% value-added tax.

The revisions to the Mining Code in 2012 changed the method by which royalties are calculated and the area of land that is assigned for exploration permits. Revisions to the mining law added a 10% tax on all mining transactions and made international commodity prices the basis for the royalty calculation. The area of land allocated for each exploration permit was reduced to 500 km² from 1,000 km² for all minerals except for the areas allocated for diamond concessions, which remain at 5,000 km² (Marouf, 2011). Mining royalties range from 1.5% to 6% of the price of the final processed mineral product. The royalty for Group 1 minerals, which includes chromium, iron ore, manganese, titanium, and vanadium, is assessed at 2.5% of the price. The royalty increases to 3% for iron ore sold at a price of between $100 and $150 per metric ton and to 3.5% for iron ore sold at a price of between $150 and $200 per metric ton. The royalty for Group 2 minerals, which includes precious and nonferrous metals, is 3% of the price on the London Metal Exchange (LME), with the exception of copper (ranges between 3% and 5%, depending on the LME price), gold (ranges between 4% and 6.5%, depending on the LME price), and platinum-group elements (4%). The royalty for Group 3 minerals, which includes coal and fuel minerals, is 1.5% of the sale price; Group 4, which includes uranium and other radioactive materials, is 3.5%; Group 5, industrial minerals and construction materials, 2.5%; and Group 6 minerals (gemstones) and Group 7 minerals (diamond), 5% and 6%, respectively (Ministère du Pétrole et de l'Energie et des Mines, 2012).

The Ministère du Pétrole et de l'Energie [Ministry of Petroleum and Energy] is responsible for overseeing activity in the fuel minerals industry. The Government approved several amendments to its Hydrocarbon Code and Mining Code in 2011.

In 2012, Mauritania was declared an Extractive Industries Transparency Initiative (EITI)-compliant country after having implemented EITI processes, which are designed to promote transparency and improve living conditions in and around mining sites. The country had an established EITI national committee and a "publish what you pay" coalition chapter, which calls on mining companies to publish what they pay to Governments (Coulibaly, 2013).

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Production

In 2013, gold production increased by 24% compared with that of 2012, iron ore output increased by 16%, and crude oil production increased by 4%. Production of other mineral commodities such as copper, gypsum, and steel remained at about the same level as in 2012 (table 1).

Structure of the Mineral Industry

In 2013, some 80 local and international companies were involved in mineral exploration and production in Mauritania. Société Nationale Industrielle et Minière (SNIM) was a majority state-owned mining company (78.35% interest). SNIM operated iron ore mines at Guelb el Aouj, Guelb el Rhein, M'Haoudat, and Zouerate in northern Mauritania. SNIM also owned and operated a 700-kilometer (km) heavy-haul railway and a shipping terminal at Nouadhibou Port on the Atlantic coast. Other companies involved in mineral production in Mauritania were privately and (or) publicly owned. Sphere Minerals Ltd., which was a subsidiary of Glencore plc (formerly Glencore Xstrata plc) of Switzerland, was a partner with SNIM in the Guelb El Aouj iron ore mining project, as well as the majority shareholder in the Askaf iron ore project. Tasiast Mauritanie Ltd. S.A. (a wholly owned subsidiary of Kinross Gold Corp. of Canada) and Mauritanian Copper Mines S.A. (MCM) (a wholly owned subsidiary of First Quantum Minerals Ltd. of Australia) were responsible for the country's gold production in 2013. Mauritanian Copper Mines was the sole producer of copper and PETRONAS International Corporation Ltd. (a subsidiary of Petroliam Nasional Berhad of Malaysia) was the sole producer of crude oil. Two companies produced cement—Ciment de Mauritanie S.A. and Mauritano-Française des Ciments S.A. Salt was produced by Société Mauritanienne des Industries du Sel (SOMISEL) (table 2).

Mineral Trade

In 2013, iron ore exports, which accounted for 51.2% of the country's total exports by value in 2013, increased by 20% to $1.36 billion from $1.13 billion in 2012, and gold exports increased by 6% to $472 million from $445 million in 2012. Crude oil exports, which accounted for 8.2% of the total exports, decreased by about 20% to $217 million from $271 million in 2012, and copper exports, which accounted for 8.1% of total exports, decreased by about 9% to $216 million from $238 million in 2012. Seventy-five percent of Mauritania's iron ore exports went to China, followed by Italy (11%), France (5%), and other European countries (9%) (Banque Centrale de Mauritanie, 2014, p. 37–38, 6).

Commodity Review

Metals

Copper.—The Guelb Moghrein Mine, which is an open pit mine located near the town of Akjoujt in the Inchiri District in western Mauritania, was the country's only operating copper mine. The mine was 100% owned and operated by MCM. MCM mined about 2.9 million metric tons (Mt) of ore, processed 2.8 Mt of sulfide ore grading 1.4% copper, and produced about 37,970 metric tons (t) of copper in concentrate. As of yearend 2013, MCM estimated the total mineral reserves at the Guelb Moghrein Mine, which included proven, probable, and proven possible reserves at a cutoff grade of 0.46% copper, to be 31.3 Mt of ore grading 0.92% copper and 0.69 gram per metric ton (g/t) gold. At the end of 2013, the total measured, indicated, and high-stockpile mineral resources at the Guelb Moghrein Mine were estimated to be as follows (using a cutoff grade of 0.5% copper): 30.5 Mt of sulfide "ore" containing 1.08% copper and 0.69 g/t gold and 4.2 Mt of oxide "ore" containing 1.16% copper and 1.09 g/t gold (First Quantum Minerals Ltd., 2014b).

Gold.—Two mines produced gold in Mauritania in 2013—the Guelb Moghrein copper-gold mine and the Tasiast gold mine. The Guelb Moghrein Mine produced 1,810 kilograms (kg) of gold in 2013, which was 3.8% less than the 1,882 kg of gold produced in 2012. The Tasiast gold mine, which was owned and operated by Kinross and located in northwestern Mauritania, produced 7,707 kg of gold, which was 33.7% more than the 5,770 kg of gold produced in 2012 (First Quantum Minerals Ltd., 2014a; Kinross Gold Corp., 2014).

As of yearend 2013, estimates of proven and probable mineral reserves at the Tasiast deposit were 176.6 Mt at a grade of 1.71 g/t gold for a total of 302,000 kg of gold. The measured and indicated resources were estimated to be 174.6 Mt at a grade of 0.84 g/t gold for a total of 147,000 kg of gold, and the inferred resources were about 31.2 Mt at a grade of 0.79 g/t gold for a total of 246,000 kg of gold. In 2013, Kinross took a writedown of about $3.1 billion on the Tasiast Mine following changes in its future expansion plan as a result of increasing operating costs and decreasing gold prices on the world market (Kinross Gold Corp., 2014).

Gryphon Minerals Ltd. of Australia was exploring for copper and gold in three locations in Mauritania—the Akjoujt, the Saboussiri, and the Tijirit projects in 2012. In 2013, however, Gryphon discontinued exploration at the Akjoujt and the Saboussiri properties to focus on the Tijirit gold project, which is located in northwestern Mauritania in a gold district that includes the Tasiast gold deposit. The project, which was wholly owned by Gryphon, encompassed continuous exploration licenses covering an area of about 1,400 km^2. Gryphon's activity in 2013 included mapping, sampling, and identifying future drilling programs in the event that the company should decide to expand exploration activity once gold market conditions improve (Gryphon Minerals Ltd., 2014).

Iron Ore.—SNIM produced a record 13.0 Mt of iron ore in 2013 and was expected to ramp up production in 2014. SNIM was implementing a capacity-building and -expansion plan; it called the plan Nouhoudh (rising up) and aimed for it to increase the project's iron ore production to 40 million metric tons per year (Mt/yr) and make SNIM one of the world's top exporters of seaborne iron ore. The identified resources in Tiris Province, which include the Guelb el Rhein deposit, were more than 5 billion metric tons of magnetite iron and several hundred million metric tons of hematite iron ore.

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The Guelb el Rhein deposit has magnetite ore grading 37% iron, which was enriched at the Guelb el Rhein plant by dry magnetic separation to bring the iron content up to 66%. The plant had the capacity to concentrate 5 Mt/yr of iron ore. Hematite iron ore deposits were located at the Kedia d'Idjill and M'Haoudat areas, which accounted for 60% of SNIM's iron ore production. SNIM reported an increase of its iron ore resources by 830 Mt, which was discovered in the Zouerate area. The Government expected that five more mines would become operational in the next 3 years. SNIM has been developing its facilities to achieve its production target of 18 Mt/yr of iron ore by 2016. The work included increasing the production capacities of the existing mines and constructing a new beneficiation plant at the Guelb el Rhein Mine that would have the capacity to produce 4 Mt/yr of concentrated iron ore. The $710 million expansion project was financed by multiple donor institutions. SNIM was also building a new ore-carrier port next to the existing port at Nouadhibou to enable handling of 170,000-t-capacity ships in the first phase and 250,000-t-capacity ships in the second phase, as well as upgrading the 700-km iron ore railway between the iron ore mines and the port. In 2013, Mauritania's capacity to process, transport, and export iron ore reached 16 Mt/yr, following completion of construction of a second loading wharf at the Port of Nouadhibou on the Atlantic coast (Thomson Reuters, 2013; Société Nationale Industrielle et Minière, 2014b).

Glencore, which acquired 87% of Sphere Minerals Ltd. of Australia in 2011, completed a feasibility study for the Askaf iron ore project and a prefeasibility study for the Guelb el Aouj phase 1 iron ore project, which was a joint venture with SNIM to develop a 15-Mt/yr-capacity iron ore mine at Guelb el Aouj. Guelb el Aouj is considered a large-scale iron ore production project, which is located in an area that hosts about 4 billion metric tons (Gt) of iron ore (Glencore plc, 2014, p. 61).

In addition to its joint venture with Glencore, SNIM formed a joint venture with China Minmetals Corp. to develop the Tazadit underground mine (TUM). SNIM's share of TUM was 65% and that of China Minmetals was 35%. Mauritania Saudi Mining and Steel Co. was a 50–50 joint venture created between SNIM and Saudi Basic Industries Corp. (SABIC) to develop iron ore deposits at Guelb Atomai (Société Nationale Industrielle et Minière, 2014a, d).

PT Bumi Resources Minerals Tbk (BRM) of Indonesia owned a 60% interest in Bumi Mauritania S.A. and an 89.6% interest in Tamagot Bumi S.A. Bumi Mauritania and Tamagot were exploring for iron ore in Mauritania and held four iron ore concessions in the Tamagot region, which is located 250 km northeast of Nouakchott. In December, BRM transferred its asset in the iron ore project in Mauritania to Rubis International Ltd., which was a local partner in the project. The reason for the divestment decision was that BRM intended to focus on developing its projects in Indonesia (PT Bumi Resources Minerals Tbk, 2014, p. 9).

Societe Miniere d'Afrique du Sud et de l'Ouest S.A. (SOMASO S.A.), which was a joint venture of TransAfrika Resources Ltd. (70% interest) and Agrineq S.A. (30% interest), continued exploration work at the Kaouat iron ore project (prospecting permit 273B1), which is located 255 km northeast of Nouakchott and covers an area of 1,474 km^2. SOMASO identified an exploration target of 1 Gt of ore grading 30% iron, which could potentially be concentrated to 67% iron (TransAfrika Resources Ltd., 2014).

Charter Pacific Corp. (CPC) of Australia held an exploration permit for iron ore at the Kaoua El Khadra region, which is located near Akjoujt and the Guelb Moghrein copper-gold mine. The company owned a 51% interest in the permit, and SNIM owned the remaining 49% interest. Charter Pacific set up an exploration target of between 2.6 Gt and 4.4 Gt of magnetite banded iron formations containing between 18% and 39% iron and planned to install a magnetic separation beneficiation plant to produce higher content iron ore. Legleitat Iron Mauritanie (a 70%-owned subsidiary of CPC) was awarded a mining permit for an advanced hematite deposit that hosts direct-shipping-grade iron ore. The Legleitat iron ore deposit was an established investment site, which had an estimated inferred resource of 12.2 Mt of iron ore containing 59% iron that had the potential to support production of 1 Mt/yr of direct-shipping-grade iron ore for 10 years. CRC planned to begin production at the Legleitat site in late 2015 (Charter Pacific Corp., 2014).

Industrial Minerals

Gypsum.—Mauritania is home to one of the world's largest gypsum deposits. Sebkha N'dramcha, which is located about 50 km northeast of Nouakchott, contains at least 140 Mt of proven reserves of gypsum. Only a small fraction of the gypsum resources had been explored and mined. The country's main producer of gypsum was Société Arabe des Industries Métallurgiques (SAMIA) (50–50 joint venture of SNIM and the Industrial Bank of Kuwait); SAMIA produced 60,000 metric tons per year (t/yr) of gypsum, two-thirds of which was used as a cement additive and one-third of which was used in plaster production (table 2; Taylor and others, 2012, p. 15; Ould Eleya, 2014).

Phosphate Rock.—Mauritania's probable reserves of phosphate rock were estimated to be at least 100 Mt, including 70 Mt grading 21% phosphorus pentoxide (P_2O_5) at the Bofal deposit and 29 Mt grading 19% P_2O_5 at the Loubboira deposit. Both deposits occur in the ridges of phosphatic sedimentary rocks of Eocene age uncovered along the northern bank of the Senegal River and located 300 km east of the Atlantic coast. Bofal Indo Mining Co. S.A., which was established in 2010, was a joint venture of Archean Group of India and the Government to develop the country's first phosphate rock mine, which would be located in the Bofal-Loubboira area in southwestern Mauritania. Bofal was expected to produce 1 Mt/yr of phosphate rock by the end of 2013 but by yearend, the project was still at the reserve development stage. The company also planned to build a phosphoric acid plant by 2015 (Marouf, 2010; Taylor and others, 2012, p. 15).

Quartz.—Mauritania Minerals Co. S.A. (MMC) held a license for the establishment of the first quartz operation in Mauritania at the Oum Agueneina deposit, which contained 70 Mt of quartz. The Oum Agueneina Mine was expected to be operational in 2013 but no information on quartz production was available. The quartz mine was owned by MMC (90%) and the Government (10%) and had the capacity to produce 300,000 t/yr of quartz (Mauritania Minerals Co. S.A., 2014).

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Natural Gas and Petroleum.—Crude oil production in Mauritania came from the offshore Chinguetti oilfield. PC Mauritania I Pty. Ltd. and PC Mauritania II B.V. (subsidiaries of PETRONAS International Corporation Ltd. of Malaysia) were the operators of the Chinguetti oilfield, which produced 2.5 Mbbl of crude oil in 2013 compared with 2.4 Mbbl in 2012 (table 1). Tullow Oil plc of the United Kingdom was exploring for crude oil in eight offshore blocks. The company planned to build the first natural gas pipeline in the country to carry natural gas from the Banda gasfield to Nouakchott; production at the gasfield was expected to begin in 2015 (table 1; Marouf, 2012).

In August, Tullow began exploration operations following a technical oil discovery at Fregate-1. The company increased its exploration acreage after signing a production-sharing contract with the Government for the shallow water Block C–3 license area in April (Tullow Oil plc, 2014, p. 60).

In 2013, Repsol S.A. of Spain and RWE Dea A.G. of Germany started drilling the Ouguiya-1 well in Block 10 in the Taoudenni Basin in central Mauritania. The well was expected to be completed in 2014. Repsol was the operator and held a 70% interest in the project; RWE Dea held the remaining 30% interest. Other companies that were exploring for oil and gas in Mauritania included Total E&P Mauritania (a subsidiary of Total S.A. of France), which was exploring Block C–9 in the deep offshore area and Block A–29 in the Taoudenni Basin; Charoit Oil & Gas Ltd. of the United Kingdom; and Kosmos Energy Ltd. of the United States (Oil and Gas Journal, 2013).

Uranium.—In 2013, several companies were exploring for uranium in Mauritania. These companies included Agrineq S.A., Aura Energy Ltd., and Forte Energy N.L. (all of Australia); Alba Mineral Resources Plc. (United Kingdom); and PT Earthstone Resources Ltd. (Indonesia). Additionally, three domestic companies were engaged in uranium exploration—Lusitania Uranium Mauritania, Mauritania Resources Ltd., and Orecorp Mauritania S.A.R.L. The Government awarded an exploration license for titanium and zirconium in the northern El Abiod area to Mineralis S.A.R.L. (WISE Uranium Project, 2014).

Forte Energy, which held 10 Group 4 uranium exploration permits that covered 9,925 km^2 in the Zedens region in northern Mauritania, conducted vehicle-based radiometric surveys and very-low-frequency electromagnetic surveys at the A238, the Bir En Nar, and the Firawa prospects and at several anomalies identified near Bir Moghrein. The company renewed a 5,400-meter (m) diamond-drilling program at the Bir En Nar prospect after completing a 4,115-m reverse-circulation drilling program. The company reported the indicated and inferred mineral resource estimates for the A238, the Bir En Nar, and the Firawa prospects to be 76.8 Mt containing 266 parts per million (ppm) uranium oxide (U_3O_8) for 20,400 t of contained U_3O_8 (reported as 44.9 million pounds) at a cutoff grade of 100 ppm U_3O_8 (Forte Energy N.L., 2013).

In 2013, Aura Energy Ltd. of Australia focused its exploration activity on its eight wholly owned permits at the Reguibat craton in northern Mauritania, which covers an area of about 8,400 km^2. Aura reported the presence of carnotite-type calcrete uranium mineralization in gravel and sands. The company conducted beneficiation tests that increased the concentration of uranium by sevenfold and leaching experiments that resulted in a 94% recovery rate of uranium (Aura Energy Ltd., 2014).

Outlook

The Government has been focusing on developing the country's mineral resources in general and iron ore in particular. SNIM is planning to increase its iron ore production to 40 Mt/yr in the next decade from the current 13 Mt/yr. This goal could be achieved after the completion of the iron ore projects that are currently being implemented as partnerships between SNIM and such international mining companies as ArcelorMittal, CPC, China Minmetals, Glencore, PT Bumi Resources, and SOMASO (Société Nationale Industrielle et Minière, 2014b, c).

In March 2014, Kinross cut the cost of its Tasiast gold mine expansion project by about 41% to $1.6 billion from $2.7 billion. The National Instrument 43–101 technical report, which was released in March 2014, also indicated that Kinross would not decide the scope of the expansion project until 2015 or later. The report also projected a more than threefold increase in gold production during the 17-year mine life (Els, 2014).

SNIM signed an agreement with Glencore to develop the Askaf iron ore mine in return for access to SNIM's port, railway, and storage facilities for 18 years. Glencore was finalizing the evaluation of its two iron ore projects in Mauritania—the Askaf and the El Aouj—which were expected to produce more than 22.5 Mt/yr of iron ore when completed. Sphere Minerals signed an engineering, procurement, and construction contract worth $600 million with Essar Projects Ltd. of India to build a 7.5-Mt/yr iron ore beneficiation plant. The plant was expected to start production in 2017, but Sphere Minerals decided to move slowly with the construction of the project because of the decline in iron ore prices in the world market (Mining-technology.com, 2014).

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TABLE 1
MAURITANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
METALS						
Copper, in concentrate		36,608 r	36,969 r	35,281 r	37,670	37,970
Gold	kilograms	7,837	8,305	8,172	7,652	9,517
Iron and steel:						
Iron ore:						
Gross weight	thousand metric tons	10,524	11,534	11,160	11,200	13,000
Iron content e	do.	6,840	7,500	7,250	7,280	8,450
Steel e		5,000	5,000	5,000	5,000	5,000
INDUSTRIAL MINERALS						
Cement		324,415	552,382	565,029	644,000 e	650,000 e
Gypsum		36,928	65,245	72,153	75,000 e	75,000 e
Salt		455	391	690	700	700
MINERAL FUELS AND RELATED MATERIALS						
Petroleum, crude	thousand 42-gallon barrels	4,105	3,025	2,824	2,400	2,500

eEstimated; estimated data are rounded to no more than three significant digits. rRevised. do. Ditto.

[1]Table includes data available through December 31, 2014.

[2]In addition to the commodities listed, modest quantities of crude construction materials (clays, sand and gravel, and stone), phosphate rock, and quartz presumably were produced, but output was not reported quantitatively, and available information is inadequate to make reliable estimates of output.

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TABLE 2
MAURITANIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Ciment de Mauritanie S.A.	Nouakchott	900
Do.		Mauritano-Française des Ciments S.A.	do.	450
Copper		Mauritanian Copper Mines (MCM) (First Quantum Minerals Ltd., 100%)	Guelb Moghrein Mine, Akjoujt, Inchiri District	40
Gold	kilograms	Tasiast Mauritanie Ltd. S.A. (Kinross Gold Corp., 100%)	Tasiast Gold Mine, 300 kilometers north of Nouakchott	7,300
Do.	do.	Mauritanian Copper Mines S.A. (MCM) (First Quantum Minerals Ltd., 100%)	Guelb Moghrein Mine, Akjoujt, Inchiri District	2,900
Gypsum		Société Arabe des Industries Métallurgiques (SAMIA) [Industrial Bank of Kuwait, 50%, and Société Nationale Industrielle et Minière (SNIM), 50%]	Sebkha N'dramcha, 50 kilometers northeast of Nouakchott	100
Iron and steel:				
Iron ore		Société Nationale Industrielle et Minière (SNIM) (Government, 78.35%; Industrial Bank of Kuwait K.S.C, 7.17%; Arab Mining Co., 5.66%; Iraq Foreign Development Fund, 4.59%; Office National des Hydrocarbures et des Mines, 2.30%; Islamic Development Bank, 1.79%; private investors, 0.14%)	Guelb el Rhein, Kedia d'Idjill, and M'Haoudat Mines, Tiris Zemmour region	13,000
Do.		El Aouj Mining Co. S.A. [Société Nationale Industrielle et Minière (SNIM), 50%, and Glencore plc, 50%]	Guelb el Aouj Mine,[1] Tiris Zemmour region	7,000
Steel	metric tons	Société Arabe du Fer et de l'Acier (SAFA) [Société Nationale Industrielle et Minière (SNIM) 100%]	Nouadhibou	7,500
Petroleum, crude	thousand 42-gallon barrels	PETRONAS International Corporation Ltd. (Petroliam Nasional Berhad, 100%)	Chinguetti oilfield, 80 kilometers offshore	3,000
Quartz		Joint venture of Mauritania Minerals Co. S.A. (MMC), 90%, and Government, 10%	Oum Agueneina Mine	300
Salt	metric tons	Société Mauritanienne des Industries du Sel (SOMISEL)	Sebkha de N'Terert and Sebkhet ej Jill brine pits, in the southwestern part of the country	1,000

Do., do. Ditto
[1]Under development.

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The Mineral Industries of Morocco and Western Sahara

By Mowafa Taib

MOROCCO

In 2013, Morocco was the world's leading exporter of phosphate in all forms and the world's third-ranked producer of phosphate rock after China and the United States. The country was responsible for 16% of the world's production of arsenic; of phosphate rock, 12%; barite, 10%; cobalt, about 2%; and fluorspar, 1%. Morocco also produced a wide range of minerals that included cement, clays, copper, crude oil, feldspar, iron ore, lead, natural gas, pyrophyllite, salt, silver, talc, and zinc (table 1; Edelstein, 2014; Jasinski, 2014; Miller, 2014a, b; Shedd, 2014).

Morocco borders the Atlantic Ocean and the Mediterranean Sea in northwest Africa; its metallogenic provinces include, from the south of the country to the north, the Anti-Atlas, the High Atlas, the Middle Atlas, and the Rif. The Anti-Atlas province contains occurrences of manganese, precious metals (gold and silver), and strategic metals (cobalt, tin, titanium, and tungsten). The Middle and High Atlas provinces (the Atlas Belt) contain occurrences of barite, copper, iron, lead, manganese, and zinc. The Rif province contains occurrences of base metals and industrial minerals (Office National des Hydrocarbures et des Mines, 2014c).

In 2013, the pace of mineral sector development activities, which included exploration and production, took place at faster and higher levels than those in previous years owing to a favorable investment environment, political stability, and security compared with other countries in North Africa. The Government became involved with a record number of international mining and energy companies in both conventional and unconventional offshore and onshore crude oil and natural gas concessions; mining partnerships; and construction of solar and wind energy powerplants (Office National des Hydrocarbures et des Mines, 2014a, p. 10–11).

Minerals in the National Economy

Morocco's economy grew, in real terms, at a rate of 4.4% in 2013 compared with a rate of 2.7% in 2012. The estimated value of the energy and industry sector in 2012 (the latest year for which data were available) was about $31.3 billion, which was 30.2% of the country's nominal gross domestic product (GDP) of $103.8 billion (International Monetary Fund, 2014, p. 27; MEED, 2014, p. 115).

The diversity and total value of the exploited minerals enabled Morocco's mineral sector to play an important role in the national economy by contributing 10% of the country's GDP and by providing about 30% of total exports. Morocco's mineral industry was the leading foreign exchange earning sector for the Government, and the phosphate rock industry, which employed about 41,000 people in 2013, continued to be a major source of export earnings. The contribution of the industrial sector to the country's overall economic growth decreased by 0.3% in 2013 compared with that of 2012. The decrease was attributed to lower mineral commodity prices in the world market (Manar and Mankoub, 2014, p. 3; Office National des Hydrocarbures et des Mines, 2014a, p. 8).

The flow of foreign direct investment (FDI) to Morocco increased by 23% to $3.36 billion in 2013 from $2.73 billion in 2012, and the flow of FDI out of Morocco decreased by 18% to $331 million from $406 million. Seventy-three percent of the FDI inflows went to greenfield projects in 2013 compared with 51% in 2012. The value of FDI stock in Morocco at yearend 2013 was $50.3 billion compared with $8.8 billion at yearend 2000 (United Nations Conference on Trade and Development, 2014, p. 37, 205, 209, 218).

Government Policies and Programs

In July, the Government approved a new national strategy for development of the mining industry that included the drafting of a new mining law; the proposed law was submitted to the Parliament for review and approval, but as of yearend 2013 had not been approved. The new mining law would overhaul the Mining Code Bill No. 1–73–412 of August 13, 1973, and was intended to attract investors, boost exports, and help ensure that companies respect the Government's labor and environmental laws. The new national strategy was intended to triple revenues from the mining industry by 2025, increase the value of investment in mineral exploration by 10 times, and double the number of direct jobs in the mining sector to 30,000. The Government-established targets for the mining industry (other than phosphate rock and phosphate-based fertilizers and products) included increasing the value of the industry's economic activity to more than $2 billion, increasing investment in exploration to $500 million, and creating 15,000 new job opportunities (Ministère de l'Energie, des Mines, de l'Eau et de l'Environnement, 2013, p. 3; 2014a; OCP Group, 2014, p. 10).

Phosphate rock mining and the phosphate fertilizer manufacturing sector accounted for about 4.3% of the country's GDP in 2013. The Government was planning to increase Morocco's share of the world's phosphate commodity market to 40% from 28% by focusing on increasing its exports to other countries in Africa and to Brazil and India (OCP Group, 2014, p. 10).

The Government agency responsible for oversight of the energy and mineral industries is the Ministère de l'Energie, des Mines, de l'Eau et de l'Environnement (MEM) [Ministry of Energy, Mines, Water, and the Environment]. Under the MEM, a wide range of central and regional agencies worked on managing activities related to electricity consumption and production, geologic studies, hydrocarbons exploration and production, mining, and development of renewable energy.

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The Office National des Hydrocarbures et des Mines [National Office of Hydrocarbons and Mines] (ONHYM) is the primary agency responsible for the exploration and promotion of the country's mineral resources. The ONHYM was created in 2005 by the merger of the Bureau de Recherches et de Participations Minières [Office of Research and Mining Investments] and the Office National de Recherches et d'Exploitations [Office of Research and Development]. All minerals are the property of the Government, which issues, through ONHYM, permits and licenses for the exploration and exploitation of mineral resources. In 2013, mining legislation continued to be based on the Mining Code Bill No. 1–73–412 of August 13, 1973, and is enforced through Executive orders and the Directorate of Mines. Exploration permits are awarded for an initial 3-year period for an area that covers up to 16 square kilometers (km^2); these permits are renewable for 4 additional years. Exploitation permits are awarded for 4-year periods and are renewable for 12 years in 4-year increments. The Government provides incentives for mining companies that include tax exemptions on imported equipment for investments that exceed $25 million and a reduced tax rate of 17.5% for companies that export their output and for companies that supply ores to mineral processing and beneficiation companies. The Government also contributes 5% of the project value to mining projects that invest more than $25 million. The Government contribution goes to infrastructure development, such as building roads and supplying electricity and water to the project area (Office National des Hydrocarbures et des Mines, 2014b, d).

The Office National de Recherches et d'Exploitations Pétrolières (ONAREP) [Office of Research and Petroleum Exploitation] is responsible for overseeing the energy sector. The Government promotes investment in the hydrocarbon sector by offering fiscal incentives that allow international oil and gas companies to acquire up to a 75% share of production in return for investing a portion of their profits in further exploration in the country's open areas onshore and offshore. The royalty on crude oil is 10% and that on natural gas is 5%, and a corporate tax holiday for 10 years is given for the discovery of crude oil and for natural gas discoveries (Office National des Hydrocarbures et des Mines, 2014d; PetroMaroc Corp. plc, 2014, p. 10).

Production

Phosphate rock was Morocco's most important mineral commodity in terms of the value and volume of production and accounted for most of the value of the country's mining output in 2013. Notable increases in the quantity of mineral commodity production in 2013 compared with that of 2012 included that of phosphate fertilizer (64%), crude oil (15%), phosphoric acid (13%), silver and mined lead (12% each), and cobalt metal (3%). Nickel output decreased about (39%), salt (33%), fuller's earth (28%), copper in concentrate gross weight (21%), zinc in concentrate gross weight (10%), and cement (6%). Refined petroleum products output decreased by 11%, on average, in 2013 compared with that of 2012 (table 1).

Structure of the Mineral Industry

The Office Chérifien des Phosphates [Office of Moroccan Phosphates] (OCP), which is also known as OCP Group, was responsible for phosphate rock and phosphate-based fertilizer production in Morocco. OCP, which was the country's sole Government-owned producer of phosphate rock, exported most of its output and used the revenues to help the Government reduce the country's trade deficit (OCP Group, 2014, p. 10).

Managem S.A., also known as Groupe Managem, was a publicly listed company that produced such base metals as cobalt, copper, lead, and zinc; precious metals, such as gold and silver; and industrial minerals, such as arsenic, fluorspar, and sodium sulfate. In addition to mining, Managem conducted mineral exploration, marketing, processing, and services through its subsidiaries. Managem was the leading metal-mining company in Morocco. It operated mining development projects in Morocco and some other African countries and employed more than 8,000 people in 2013 (Managem S.A., 2014e, p. 16–20).

Although Morocco had a long history of mining, an established infrastructure, and a low sovereign risk, its mineral resources were relatively unexplored compared with many other countries in Africa. By the end of 2013, 42% of the country's total area had undergone geophysical mapping, 35% geologic mapping, and 8% geochemical mapping. The ONHYM had several mining projects ongoing, including 66 drilling programs at Aghracha, Lahjeyra, Laknouk, and Twihinate in Awsered Province; Jabal Lahouanit in Bouarfa Province; Mfis in Errachidia Province; and Iraouene-Mouzared in Tinghir Province. In February, the ONHYM approved a partnership agreement with Maya Gold and Silver Inc. of Canada for the development and exploitation of the Boumadine polymetallic deposit, which is located in the Errachidia Province (Office National des Hydrocarbures et des Mines, 2014a).

In April, the ONHYM approved an exploration agreement with Pharm Mining Inc. of Canada for gold exploration and development of the Tichka East sector property, which is located in Al Haouz, Chichaoua, and Taroudant Provinces. The ONHYM was working with Kasbah Resources Ltd. of Australia on the development of tin resources at the Achmmach tin mine; with Metalex Ventures Ltd. of Canada, which was exploring for diamond and gold in southern Morocco; and with Tolsa Group of Spain, which was exploring for bentonite in northern Morocco (Office National des Hydrocarbures et des Mines, 2014a).

In 2013, the ONHYM conducted 44 exploration studies throughout the country; 28 were ONHYM projects and 16 were carried out in partnership with local and international mining companies. The ONHYM studies included 11 precious metals studies, 9 base metals and energy substances studies, and 6 industrial minerals studies (Office National des Hydrocarbures et des Mines, 2014a, p. 27).

Artisanal mining has been practiced for many years in Morocco, especially in the Tafilalet and Figuig region near Meknes. Artisanal mining for barite, lead, and zinc ores is legal within the Central d'Achat et de Développement de la Région Minière du Tafilalet and Figuig (CADETAF), and mined products were sold to local collection centers, which

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were equipped with chemical analysis, storage, and weighing facilities. The Government took steps to support artisanal mining at CADETAF by improving working conditions and increasing productivity and safety (Ministère de l'Energie, des Mines, de l'Eau et de l'Environnement, 2014b).

Mineral Trade

In 2013, Morocco's total exports increased by 3% to about $21.9 billion from $21.3 billion in 2012. Similarly, the value of imports increased by 4% to $44.9 billion from $43.3 billion in 2012. In terms of value of trade, the European Union (EU) (54%), the United States (6.4%), China (5.2%), and Saudi Arabia (4.2%) were Morocco's major trade partners in 2013. Sixty-one percent of Morocco's exports went to the EU, 5.9% to Brazil, 4.2% to the United States, 3.7% to India, and 1.9% to Turkey (European Commission, The, 2014, p. 9; United Nations, 2014, p. 7).

In 2013, Morocco accounted for 28% of world exports of phosphate rock and phosphate-based products. In 2012 (the latest year for which data were available), exports of phosphate fertilizers and chemicals were valued at $2.0 billion; phosphoric acid exports, $1.6 billion; and phosphate rock exports, $1.5 billion. Morocco was Africa's second-ranked hydrocarbon importer, importing 99% of its crude oil and 91% of its natural gas. The value of petroleum products imports was about $13 billion in 2013, which was 20% of the country's total imports. Sulfur imports, which were used to manufacture phosphate fertilizer, increased in value to $827 million in 2012 (the latest year for which comprehensive information was available) from $822 million in 2011 and $366 million in 2010 (United Nations International Merchandise Trade Statistics, 2014).

U.S. exports to Morocco were valued at about $2.5 billion in 2013 compared with about $2.2 billion in 2012. The major exports included, in descending order of value, fuel oil ($856 million), coal and other fuels ($208 million), petroleum products ($72 million), metallurgical-grade coal ($54 million), natural gas liquids ($43 million), steelmaking materials (about $28 million), nonmetallic minerals ($17 million), and iron and steel mill products ($15 million). U.S. imports from Morocco were valued at about $978 million in 2013 compared with $932 million in 2012. This total included, in descending order of value, chemical fertilizers ($255 million), sulfur and nonmetallic minerals ($232 million), semiconductors (about $72 million), and inorganic chemicals (about $3 million) (U.S. Census Bureau, 2014a, b).

Commodity Review

Metals

Cobalt.—Compagnie de Tifnout Tighanimine (a subsidiary of Managem) mined cobalt ore at the Bou-Azzer Mine. The Bou-Azzer underground mine is located 35 kilometers (km) south of Ouarzazate in southern Morocco within the central Anti-Atlas Mountain range. Cobalt production increased slightly (by 3%) in 2013 in terms of metal content compared with that of 2012, which in turn was a decrease of 23.5% compared with that of 2011 (table 1). The mine had the capacity to produce 2,000 metric tons (t) of cobalt metal and employed 1,600 people (Managem S.A., 2014b).

Gold.—Morocco had one gold-producing mine in 2013. The Akka Gold Mine was operated by Managem and had a production capacity of 725 kilograms per year (kg/yr). The mine is located 280 km southwest of Agadir at Iourim in the Anti-Atlas Mountain region (Managem S.A., 2014a). In 2013, Maya Gold held both exploration and exploitation licenses for its 80-km^2 Amizmiz project in southwestern Marrakech Province where it was exploring for high-grade gold deposits. Maya Gold confirmed that the property has polymetallic gold-bearing veins in multiple zones. The drilling at Amizmiz was focused on the AZ and the TRN zones in order to better define the information in the National Instrument (NI) 43–101 technical report, which was filed by Maya Gold with the Canadian Security Administrators in 2011 and stated that the estimated inferred resource was 819,800 t grading 12.98 grams per metric ton (g/t) gold. The NI 43–101 technical report also stated that the estimated inferred resource did not demonstrate economic viability (Maya Gold and Silver Inc., 2014b).

Silver.—In 2013, silver production increased by 12% to 194,077 kilograms (kg) from 173,400 kg in 2012, which ranked Morocco as the world's 16th-ranked producer of silver, according to Silver Institute statistics (Silver Institute, 2014). Silver occurs both as the primary metal in ore deposits and as a byproduct in cobalt, copper, lead, and zinc deposits. Silver was produced at the Imiter Mine. The mine is located in the Anti-Atlas region and was owned by Société Metallurgique d'Imiter. The Imiter Mine, which was the 14th largest silver mine in the world in terms of output, produced 194,000 kg of silver in 2013 (table 2; Mining Magazine, 2013, p. 26; Managem S.A., 2014c).

Maya Gold held exploration and exploitation licenses for five properties in Morocco, among which were the Boumadine Mine and the Zgounder Mine. The Boumadine Mine, which is located in western Morocco near Tinejdad, had an estimated historical (1992) polymetallic reserve of 4 million metric tons (Mt) grading 3.8% zinc, 1.5% lead, 200 g/t silver, and 3.5 g/t gold. In 2013, a new company, Zgounder Millennium Silver Mining, was created as a joint venture of Maya Gold (85% interest) and ONHYM (15% interest) to explore and develop the Boumadine deposit, which was estimated to contain 240,000 t of recoverable material grading 3.25 g/t gold and 192 g/t silver. The Zgounder Mine, which is located 150 km south of Marrakech, had an estimated historical (2004) reserve of 582,000 t with an average grade of 361 g/t silver. The mine also had an estimated additional 500,000 t of tailings at an average grade of 125 g/t silver. Zgounder Millennium Silver Mining also operated the Zgounder Mine, which was expected to re-open in 2014 and was expected to produce about 2,380 kg/yr of silver concentrate (Chadwick, 2013; Maya Gold and Silver Inc., 2014a, c, d).

Tin.—In 2013, Kasbah continued working on the definitive feasibility study of the Achmmach tin project, which was located in the El Hajeb region in the Central Hercynian Massif, about 140 km southeast of Rabat. The project covered a 32-km^2 area. Kasbah's strategy was to increase the size of the deposit's identified resource, to prove the economic viability of the project, and to advance Achmmach to a development decision.

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Kasbah owned 100% of the exploration and exploitation rights to Achmmach. In December, Kasbah signed a shareholder agreement with Toyota Tsusho Corp. (TTC) and Nittetsu Mining Co. Ltd. (NMC), both of Japan, for the development of the Achmmach tin mine. Under the new agreement, Kasbah's share in the mine was reduced to 75% whereas TTC's share was 20% and NMC's share was 5%. The company was expected to complete a prefeasibility study, definitive feasibility study, and maiden ore reserves estimates in March 2014. Kasbah was preparing a financing plan for the project; the plan was expected to be completed by the third quarter of 2014. Kasbah updated the measured resource at Achmmach to 1.6 Mt from 500,000 t and the total resource to 14.6 Mt of ore grading 0.85% tin for 124,100 t of contained tin. According to the company, the Achmmach project represented one of the top undeveloped tin deposits in the world and was regarded as the potential leading tin mine in Africa in terms of the volume of production (Kasbah Resources Ltd., 2014a, c, p. 2).

The Bou El Jaj tin project (BLJ) is located about 15 km from the Achmmach tin project and is the southernmost extension of a mineralized corridor that is about 2.5 to 3 km wide and nearly 12 km long in strike. BLJ, which was 100% owned by Kasbah, had a strong surface geochemical signature for tin with outcropping tin mineralization evident along 2,100 meters (m) of strike length. A 5,000-m core-drilling program was initiated in late 2012. No updates were available on the project in 2013 (Kasbah Resources Ltd., 2014b).

Industrial Minerals

Barite.—Morocco's production of barite nearly doubled during the past 5 years. Barite production increased to about 1.1 Mt in 2013 from 1.0 Mt in 2012 and about 0.6 Mt in 2009. Broychim S.A.R.L. was one of the main producers and exporters of barite products in the country. Broychim exported barite to the United States and to countries in Africa, Europe, and the Middle East. The volume of Broychim's exports had increased steadily to 400,000 t in 2013 from 160,000 t in 2009. Other barite producers in Morocco included CADETAF, Compagnie Marocaine des Barytes S.A., Société Nord-Africaine de Recherches et d'Exploitation des Mines d'Argana, and Société Nouvelle Union des Metaux Maroc (tables 1 and 2; Broychim S.A.R.L., 2014).

Cement.—In 2013, cement production decreased by 6% to 14.9 Mt from a revised 15.9 Mt in 2012. Morocco and Western Sahara's cement production capacity increased to more than 24 million metric tons per year (Mt/yr). The capacity included 1.9 Mt/yr of grinding capacity, 0.5 Mt of which is located in Laayoune in the Western Sahara. The major producers of cement in Morocco included Lafarge Maroc S.A., which was 50% owned by Lafarge Group of France (and the country's top producer of cement) and held 38% of the country's total capacity; Holcim Maroc S.A., which was majority owned (61%) by Holcim Ltd. of Switzerland and held 22% of total capacity; Ciments du Maroc S.A., which was majority owned (58.3%) by Italcementi Group of Italy and held about 20% of total cement production capacity; and Ciments de L'Atlas, which held 13% of total capacity (Edwards, 2014).

Fluorspar.—Société Anonyme d'Entreprises Minières produced acid-grade fluorite (CaF_2) from El Hammam Mine, which was the only fluorite mine in Morocco and was located 63 km south of Meknes in the Middle Atlas region of Morocco. In 2013, the company had the capacity to produce 100,000 t/yr of fluorspar and employed 500 people. Fluorite mineralization at the Djebel El Hammam, where the mine is located, occurs in calcium-bearing silicate rocks that include concentrations of copper sufide, lead sulfide, and zinc sulfide. The fluorite veins, which included the El Hammam vein, the Bergamou vein, and the Gouaida vein, are hosted in the series of sandy shales, mudstones, and limestones of Paleozoic metamorphosed levels (Managem S.A., 2014c, d; Mindat.org, 2014).

Phosphate Rock.—In 2013, the areas of Morocco and Western Sahara combined held more than 50 billion metric tons (Gt) of phosphate rock reserves, which was about 75% of global phosphate reserves. OCP, which employed 23,000 people, had committed to investing up to $5 billion during the next decade to develop the infrastructure for new mines and wash plants and to shift the industry more toward beneficiation and fertilizer production (OCP Group, 2014).

In 2013, OCP produced 26.4 Mt of phosphate rock, 4.4 Mt of phosphoric acid (in terms of P_2O_5), and 7.4 Mt of phosphate-based fertilizers, including diammonium phosphate, monoammonium phosphate, and triple superphosphate. The company's capacity in 2013 was 32.2 Mt/yr of phosphate rock, 4.8 Mt/yr (in terms of P_2O_5) of phosphate-based fertilizers, and 4.7 Mt/yr of phosphoric acid. The company's share in the trade market of phosphate rock was 50% for phosphoric acid, 40% phosphate rock, and 21% for phosphate-based fertilizers. OCP, which was the world's leading exporter of phosphate rock, announced plans to increase its production of phosphate rock to 50 Mt/yr by 2020. The company was responsible for the production and sale of phosphate rock and manufactured phosphoric products at the Benguerir, the Khouribga, and the Youssoufia Mines in central Morocco and the Bou Craa Mine in Western Sahara (OCP Group, 2014, p. 11).

In 2013, OCP launched the Jorf Phosphate Hub, which was a $1.2 billion investment at Jorf Lasfar, which is located about 125 km southwest of Casablanca, and tested the slurry pipeline that would transport phosphate rock from the Khouribga phosphate mine to Jorf Lasfar where it would be processed and later exported. A 300-acre site was set aside for phosphate processing plants, factories, storage warehouses, and new harbor facilities to export phosphate-based products (OCP Group, 2014, p. 15).

In February, OCP signed an agreement with the Islamic Development Bank of Saudi Arabia to fund the extension and rehabilitation of Jarf Lasfar Port, and, in September, the company received a $271 million loan from the KfW Development Bank of Germany to finance the OCP water management plan. DuPont OCP Operations Consulting was a joint venture established in May by OCP and E.I. du Pont de Nemours & Co. of the United States to provide OCP mines and plants industrial consultation and service training for better performance, safety, and sustainable development. OCP acquired a 50% interest in Bunge Ltd. of Brazil. The new company, Bunge Maroc Phosphore, would increase the

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diammonium phosphate production capacity at Jarf Lasfar to 7 Mt/yr by building two more fertilizer granulation units (OCP Group, 2014, p. 28).

OCP and Potash Corp. of Canada signed a definitive agreement that would enable Potash Corp. to buy OCP's full range of finished phosphate products to meet the needs of its customers in Canada and the United States. The two companies also signed a memorandum of understanding regarding the supply of ammonia to be provided by Potash Corp. to meet OCPs growing ammonia requirements, in particular for its new fertilizer manufacturing complex at Jorf Lasfar (OCP Group, 2014).

OCP and Fertilizantes Heringer S.A. of Brazil signed an agreement that would allow OCP to acquire about 10% of Heringer's shares through investment. This transaction would enable Heringer to expand its fertilizer mixing capacity in its main markets. The two companies also signed an agreement for the long-term supply of phosphate products, which would start after the finalization of the investment (OCP Group, 2014, p. 28).

Mineral Fuels and Other Sources of Energy

In 2013, the Government awarded a total of 52 onshore exploration permits (13 of which were awarded to ONHYM), 90 offshore permits, 4 onshore prospecting zones, and 2 offshore prospecting zones. The Government licensed 12 exploitation concessions, 2 of which were licensed to ONHYM. The combined area for these permits was more than 394 km^2. The permit holders of onshore permits included such companies as Longreach Oil Ltd. of Australia; East West Petroleum Corp., Petromaroc Corp. plc, and Vermillion Energy Inc. of Canada; Circle Oil Maroc Ltd. of Ireland; Repsol Exploration Atlas S.A. of Spain; Cabre Maroc Ltd. (a subsidiary of Gulfsands Plc.) and San Leon Energy Plc of the United Kingdom; and Anadarko Petroleum Corp. of the United States. The companies that held offshore permits were Kosmos Energy Ltd. of Bermuda; Total S.A. of France; Genel Energy Plc of Turkey; Capricorn Exploration and Development Co. Ltd. (a subsidiary of Cairn Energy Plc of the United Kingdom); and Chevron Morocco Exploration Ltd. (a subsidiary of Chevron Corp. of the United States) (Office National des Hydrocarbures et des Mines, 2014a, p. 12, 22).

Natural Gas.—Morocco produced modest quantities of natural gas, which amounted to 45.16 million cubic meters in 2013 compared with 43.45 million cubic meters in 2012. Additionally, the country received royalties for allowing transmission of natural gas from Algeria to Spain through its territory. The Europe-Maghreb Pipeline netted Morocco 708 million cubic meters of natural gas in 2013 compared with 657 million cubic meters in 2012. The country's natural gas consumption, which totaled more than 1 billion cubic meters, was far greater than domestic production of natural gas and natural gas royalties from the Algerian gas pipeline passing through Morocco. Morocco imported natural gas from Algeria at a rate of 640 cubic meters per year under a 10-year contract (Office National des Hydrocarbures et des Mines, 2014a, p. 23, 36; U.S. Energy Information Administration, 2014).

Circle Oil Maroc Ltd. (COML), which was a wholly owned subsidiary of Circle Oil Plc of Ireland, continued exploration and exploitation at the Rharb basin in northwestern Morocco. COML held two permits—the Lalla Mimouna permit and the Sebou Oulad N'Zala permit. The Lalla Minouna permit covers 2,211 km^2 and gives COML 75% interest and ONHYM 25% interest in the project for a period of 8 years and could be renewed to 30 years. In 2013, COML increased its natural gas production at the Sebou Oulad N'Zala to 198,000 cubic meters per day from 127,500 cubic meters per day. In January, the company reported natural gas reserves estimates for the Sebou field, which covers an area of 134 km^2, to be 854 million cubic meters and the remaining reserves at yearend 2013 to be about 730 million cubic meters (Circle Oil plc, 2014).

Petroleum.—Petroleum products made up about 61% of the country's energy consumption in 2012 (the latest year for which comprehensive information was available), followed by coal, 20%, and natural gas, about 7%, The Government's energy strategy, which aimed to reduce dependence on hydrocarbon imports, was to establish financial terms for hydrocarbon exploration agreements that would attract investment in the hydrocarbon sector. The strategy capped the Government's share in hydrocarbon projects at 25%, which was less than the 50% share held by other North African countries (Algeria and Libya). About 40 international oil companies were involved in drilling operations for oil and gas in Morocco, with some licenses extending to 25 years, allowing them to acquire 75% of the value of extractions in return for the companies investing part of their revenues in additional exploration operations and paying fees. In 2013, the ONHYM signed 6 new petroleum agreements, renewed 6 existing agreements, amended 13 existing agreements, and signed 6 memoranda of understanding (Office National des Hydrocarbures et des Mines, 2014a, p. 10).

In 2013, Morocco had 10 known oil shale deposits that contained an estimated 3.5% of the world's oil shale resources. According to U.S. Energy Information Administration estimates, the oil shale deposits in Morocco and Western Sahara contained 567 billion cubic meters of technically recoverable shale gas and 200 million barrels of shale oil in place. Projected production from oil shale deposits was estimated to be 50,000 barrels per day. The oil shale deposits include (1) the Tadla basin in Central Morocco; (2) the Tarafaya basin in southwestern Morocco; (3) Timahdit, which is the second largest deposit in Morocco and is located in the Middle Atlas Mountains; and (4) the Tindouf basin, which extends across Morocco and Western Sahara. In 2012, core drilling at the deposit had identified estimated reserves of 42 Gt of oil shale containing an estimated 15 billion barrels of oil in place (Office National des Hydrocarbures et des Mines, 2014a; Tar Sands World, 2014; U.S. Energy Information Administration, 2014).

Genel was involved in three offshore blocks in Morocco—the Mir Left Block (75% interest), the Sidi Moussa Block (60% interest), and the Juby Maritime Block (37.5% interest)—which cover a total area of 16,500 km^2. In 2013, the company was drilling exploratory wells south of the Moroccan coast bordering the Canary Islands to reach layers of oil associated with Jurassic carbonates. The company planned to continue drilling to a depth of 600 m in order to confirm the size of the oil reserves. Genel estimated oil and gas reserves located between Tan Tan and Tarfaya to be 900 million barrels of oil. Genel planned to carry out further drilling to determine the nature and size of

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the possible reserves in the region. The company has explored about 2,000 km² in Morocco using geologic three-dimensional vibration (Genel Energy plc, 2014).

Chariot Oil and Gas Ltd. held three oil and gas prospecting licenses that cover 14,500 km², including a 75% ownership and operational interests in two offshore licenses in the Loukos and Mohammedia prospecting area, The company also held a 50% equity interest in the Rabat Deep permits 1 through 4 (Chariot Oil and Gas Ltd., 2014, p. 27).

Renewable Energy.—Morocco was the leading importer of hydrocarbons in North Africa in 2013. Thus, the Government was focused on reducing its fuel and electricity imports, which amounted to more than $3 billion in 2013, and on meeting the projected increase in power demand of 6.5% per year through renewable energy sources. The Government planned to invest $13 billion in expanding the country's capacity for hydroelectric, solar, and wind power generation, which could increase the share of renewables in the energy mix to 42% by the year 2020 from the current share of 8% (Zafar, 2014).

The Government aimed to install 2,000 megawatts (MW) of solar power generating capacity by 2020 by building large-scale solar powerplants using modern solar thermal, photovoltaic, and concentrated solar power techniques at five locations—the Ain Beni Mathar in central Morocco, the Boujdour in Western Sahara, the Laayoune in Western Sahara, the Ouarzazate, and the Tarfaya south of Agadir. These powerplants were expected to cost $9 billion and to meet 20% of the country's electricity demand when completed by 2019. Construction of the first phase of the 160-MW-capacity Ouarzazate thermo-solar powerplant began in April and was expected to be completed in 2015. The first and second phases of the Ouarzazate thermo-solar powerplant were expected to cover 3,000 hectares and to have 500 MW of electricity-generating capacity that would meet the electricity needs of 1.5 million people in the Ouarzazate area (Phys.org, 2013; Zafar, 2014).

With a coastline that extends 3,500 km, Morocco has vast potential to generate electricity from wind energy. The first 50-MW-capacity wind farm in the country was built in 2000 in El Koudia El Baida in Tetouan Province, followed by a 60-MW-capacity wind farm at Cap Sim south of Essaouira in 2007, and 140-MW-capacity wind farms at Allak, El Hound, and Beni Mejmel in 2010. The Government was implementing a plan that would increase the country's wind farm electricity-generating capacity to 2,000 MW by 2020 (Office National de l'Electricite et de l'Eau Potable, 2014).

Outlook

The Government has been focusing on increasing investments in the mineral sector and establishing joint ventures with international companies, particularly in the natural gas, metals, and petroleum sectors. The Government is expected to take additional steps to privatize selected state-owned mining assets and to launch reform programs within the mining industry to boost the industry's competitiveness. In addition to phosphate rock, silver and tin could prove to be significant mineral commodities for Morocco as Maya Gold and Kasbah continue to develop their silver and tin resources, respectively. The OCP is expected to continue to establish joint ventures with international companies to ensure more effective operations and entry into new markets as well as continued focus on Brazilian and Indian markets. Managem is likely to expand its operations inside and outside the country, whereas ONYHM is expected to continue to support development of the hydrocarbon and mining industries. The development of Morocco's hydrocarbon and renewable energy resources is expected to decrease the country's dependence on hydrocarbon imports and to increase its supply of electricity.

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WESTERN SAHARA

The issue of sovereignty for Western Sahara, which was claimed by the Moroccan Government, the Saharawi Arab Democratic Republic (SADR), and the Popular Front for the Liberation of the Saguia el Hamra and Rio de Oro (Polisario), remained unresolved in 2013. About 85% of the Western Sahara territory was administered by the Government of Morocco, and the remaining 15% was under the administration of the Polisario. The territory is a desert area bordering the Atlantic Ocean between Mauritania and Morocco. Western Sahara's economy continued to be dependent on fishing, pastoral nomadism, and phosphate rock mining (Crisp, 2014).

Phosphate de Boucraa S.A. (Phosboucraa) was a fully owned subsidiary of OCP, which was responsible for mining, beneficiation, transportation, and marketing of phosphate rock at the Bou Craa Mine. The mine had the world's longest conveyor belt, employed 2,100 people (most of them locals), and held 1.6% of Morocco's phosphate rock reserves. Phosphate rock mined in Western Sahara was moved by a conveyor belt for a distance of more than 100 km to the Port of El Aaiun. The phosphate ore was offloaded to cargo vessels for transport to various countries where the phosphate is used in fertilizer production. According to Western Sahara Resource Watch, 2.2 Mt of phosphate rock valued at $330 million was exported in 2013 compared with 1.8 Mt valued at $340 million in 2012. Phosphate rock exports went to the United States (32%), Lithuania (18%), New Zealand (14%), Mexico (12%), Canada (8%), Colombia (5%), Australia (3%), and others (6%) (Western Sahara Resource Watch, 2014).

The issue of the disputed territory of Western Sahara was recently raised by the Polisario as interest in offshore oil exploration increased because some of the significant area in the offshore concession, which was held by Kosmos Energy, is located in the disputed region. The dispute could raise legal issues concerning exploration and development of offshore hydrocarbon resources in the territorial waters of Western Sahara (Sahara Press Service, 2013; Crisp, 2014).

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TABLE 1
MOROCCO AND WESTERN SAHARA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
METALS						
Antimony, antimony oxide		1700 r	1700 r	15,700 r	7,100 r	7,000
Cobalt:						
Concentrates, gross weight		26,100	31,095	21,587	20,000 r	20,330
Metal[3]		1,600	1,582 r	1,718 r	1,314	1,353
Copper:						
Concentrates, gross weight		42,100	53,300 r	43,000 r	59,000 r	46,320
Cu content, concentrates		12,615	12,690	12,893	17,700 r	18,000
Gold	kilograms	470 r	650	520	519 r	550
Iron and steel:						
Iron ore:						
Gross weight		30,523 r	44,665	78,926	260,700 r	301,100
Fe content (54%)		16,470	24,119	42,620	140,778 r	145,800
Metal:						
Pig iron[e]		15,000	15,000	15,000	15,000	15,000
Steel, crude		499,000 r	485,000 r	654,000 r	539,000 r	558,000
Lead:						
Concentrate:						
Gross weight		49,030 r	46,373	43,821	39,100 r	43,700
Pb content		20,100 r	38,200 r	36,500 r	15,600 r	17,435
Cuprous matte, Pb content		2,520 r	890 r	470 r	600 r	600
Metal, refined:						
Primary		36,000	38,237	36,469	38,000	38,000
Secondary[e]		3,000	3,000	3 000	2,500	2,500
Total[e]		39,000	41,200 r	39,500	40,000	40,000
Manganese ore, largely chemical-grade		51,788	75,614	58,000 r	90,200 r	110,970
Mercury[e]		10	10	9	8	8
Nickel content of nickel sulfate		733 r	317	217	288 r	175
Silver, Ag content	kilograms	210,000 r	243,000	186,090 r	173,400 r	194,077
Zinc concentrate:						
Gross weight		88,400	87,360	90,129	92,000	82,500
Zn content		44,199	43,680	45,065	45,800 r	47,600
Zn oxide		5,920	16,500	7,200	6,889	6,963
INDUSTRIAL MINERALS						
Arsenic trioxide		8,655	13,731	8,154	8,820 r	8,968
Barite, crude		586,937	572,429	769,504	1,021,400 r	1,094,470
Cement, hydraulic	thousand metric tons	14,519	14,000	14,000	15,871 r	14,900
Clays, crude:						
Bentonite		84,097	110,700	97,071	91,200 r	105,240
Fuller's earth (smectite)		132,110	82,570	103,682	81,800 r	59,000
Montmorillonite (ghassoul)		928	1,186	1,419	1,900 r	1,990
Feldspar[e]		28,000	--	43,889	45,000	45,000
Fertilizers	thousand metric tons	2,520	3,713	4,350	4,500	7,400

See footnotes at end of table.

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TABLE 1—Continued
MOROCCO AND WESTERN SAHARA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
INDUSTRIAL MINERALS—Continued						
Fluorspar, acid-grade		72,100 r	89,700 r	79,207	79,300 r	81,250
Phosphate rock:						
Gross weight[4]	thousand metric tons	18,307	26,603	28,052	27,060 r	26,400
P_2O_5 content	do.	6,000	8,500	8,977 r	8,659 r	8,448
Phosphoric acid	do.	3,077	3,999	4,888	4,158 r	4,700
Pyrophyllite		33,400	27,066	4,600 r	-- r	--
Salt:[4]						
Rock		310,400 r	503,351	720,814	730,000 r	488,920
Marine		16,500	20,000	25,000	25,000	20,000
Total		326,900 r	523,351	745,814	755,000 r	508,920
Sulfur, refineries byproduct		5,000	38,000	53,000	62,000	60,000
Sulfuric acid[e]		9,500	9,500	9,500	10,000	10,000
Talc		-- r	--	500 r	200 r	--
MINERAL FUELS AND RELATED MATERIALS						
Natural gas, dry	million cubic meters	60	60	60	43 r	45
Petroleum:						
Crude	thousand 42-gallon barrels	1,575	1,575	1,500	1,600	1,847
Refinery products:						
Liquefied petroleum gas	do.	951 r	336 r	429 r	1,322 r	1,114
Gasoline	do.	2,422 r	2,798 r	3,284 r	3,472 r	3,310
Jet fuel	do.	1,960 r	3,391 r	4,219 r	6,955 r	4,441
Distillate fuel oil	do.	9,914 r	14,741 r	17,374 r	19,722 r	16,121
Residual fuel oil	do.	9,144 r	12,214 r	17,962 r	14,106 r	12,854
Other[e]	do.	10,609 r	14,520 r	8,732 r	3,423 r	6,160
Total	do.	35,000 r	48,000	52,000 r	49,000 r	44,000

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. do. Ditto. -- Zero.

[1]Table includes data available through December 31, 2014.

[2]In addition to the commodities listed, gypsum, perlite, and a variety of crude construction materials are produced, but information is inadequate to make reliable estimates of output.

[3]Cobalt electrowon from cobalt concentrates and tailings from the Bou-Azzer Mine.

[4]May include production from Western Sahara.

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TABLE 2
MOROCCO AND WESTERN SAHARA: STRUCTURE OF THE MINERAL INDUSTRIES IN 2013

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
MOROCCO			
Arsenic trioxide	Compagnie de Tifnout Tighanimine Managem S.A. (CTT Managem) (Managem S.A., 55.2%, and Société Metallurgique d'Imiter, 20%)	Guemassa, Marrakech	6,100
Barite	Central d'Achat et de Développement de la Région Minière du Tafilalet et de Figuig (CADETAF) (artisanal miners)	Errachidia, Figuig, and Ouarzazate	16,000
Do.	Broychim S.A.R.L.	Casablanca	24,000
Do.	do.	Safi	150,000
Do.	Compagnie Marocaine des Barytes S.A. (COMABAR) [Norbar Minerals AS, 55%, and Office National des Hydrocarbures et des Mines (ONHYM), 45%]	Tlet Ighoud, Safi	160,000
Do.	do.	Zelmou, Figuig	110,000
Do.	Société Nord Africaine de Recherches et d'Exploitation des Mines d'Argana (SNAREMA)	Seksaoua, Marrakech	120,000
Do.	Société Nouvelle Union des Metaux Maroc	Jbel Abdellah, Errachidia	12,000
Barite, chemical grade	Société Nord Africaine de Recherches et d'Exploitation des Mines d'Argana	Argana	30,000
Bentonite	Société Miniere Bentonite d'Afarha S.A. [Grupo Tolsa, 80%, and Office National des Hydrocarbures et des Mines (ONHYM), 20%]	Aferha	9,200
Do.	Société d'Exploitation des Mines du Rif [Office National des Hydrocarbures et des Mines (ONHYM), 100%]	Bou Hoed, near Ouixane	15,000
Do.	Compagnie Marocaine des Barytes [Norbar Minerals AS, 55%, and Office National des Hydrocarbures et des Mines (ONHYM), 45%]	Azzouzet-Tidiennit	5,000
Do.	North African Industrial Minerals Exploration S.A.R.L. (S&B Group)	Trebia Mine	NA
Cement, portland	Asment de Temara (Cimentos de Portugal S.A., 57.4%)	Kiln and mill at Temara	1,250,000
Do.	Ciments de L'Atlas	Beni Mellal kiln and mill	1,600,000
Do.	do.	Settat kiln and mill	1,600,000
Do.	Lafarge Maroc S.A. (Lafarge Group, 50%)	Bouskoura, near Casablanca	3,000,000
Do.	do.	Tetouan, south of Casablanca	2,500,000
Do.	do.	Cadem clinker mill at Meknes	1,750,000
Do.	do.	Tamuda kiln and mill, Tetouan	800,000
Do.	do.	Grinding unit at Tangier	1,000,000
Do.	Holcim Maroc S.A. (Holcim AG., 61%)	Kiln and mill at Oujda	1,300,000
Do.	do.	Settat kiln and mill	1,700,000
Do.	do.	Fes, Ras El Ma kiln and mill	1,300,000
Do.	do.	Fes, Doukkarat clinker mill	600,000
Do.	do.	Nador clinker mill	400,000
Do.	Ciments du Maroc S.A. (Italcementi Group, 58.3%)	Kiln and mill at Agadir	1,400,000
Do.	do.	Kiln and mill at Marrakech	1,300,000
Do.	do.	Kiln and mill at Safi	1,000,000
Do.	do.	Laayoune clinker mill	500,000
Clay	Société du Ghassoul et de ses Derives SEFRIOUI SA	Tamdafelt	NA
Do.	Antonio Reyes Mines S.A.	Haddou Ammar, Nador	NA
Coal, anthracite	Charbonnages du Maroc [Bureau de Recherches de Participations Minières (BRPM), 98.89%]	Jerada	650,000
Cobalt:			
Ore, gross weight	Compagnie de Tifnout Tighanimine (Managem Group S.A.)	Bou-Azzer, Ouarzazate	200,000
Metal	do.	Guemassa, Marrakech	2,500
Copper, concentrate	Société Minière de Bou Gaffer (SOMIFER) [Office National des Hydrocarbures et des Mines (ONHYM), 34.2%; Société Metallurgique d'Imiter, 36%; Managem S.A., 7.6%]	Bleida	50,000
Do.	Compagnie Minière de Guemassa (CMG) [Managem S.A., 74%, and Office National des Hydrocarbures et des Mines (ONHYM), 23.08%]	Douar Hajar Mine, Guemassa, Marrakech	18,000
Do.	Société de Développement du Cuivre de l'Anti-Atlas (SODECAT) [Office National des Hydrocarbons et des Mines (ONHYM), 100%]	Tiouit	4,500

See footnotes at end of table.

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TABLE 2—Continued
MOROCCO AND WESTERN SAHARA: STRUCTURE OF THE MINERAL INDUSTRIES IN 2013

(Metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
MOROCCO—Continued				
Fluorspar, concentrate		Société Anonyme d'Entreprises Minières (Managem S.A., 58%, and Société Metallurgique d'Imiter, 42%)	El Hammam, Khemisset	100,000
Gold	kilograms	Akka Gold Mining Company [Managem S.A., 70%, and Office National des Hydrocarbures et des Mines (ONHYM), 16.07%]	Iourim, Tiznit	725
Iron ore		Société d'Exploitation des Mines du Rif [Office National des Hydrocarbures et des Mines (ONHYM), 100%]	Bouhoua, Nador	120,000
Concentrate		Compagnie Minière de Guemassa (CMG) [Managem S.A., 74%, and Bureau de Recherches de Participations Minières (BRPM), 23.08%]	Douar Hajar Mine, Guemassa	29,900
Do.		Compagnie Minière de Touissit (CMT) (Emerging Capital Partners, 50%, and Truffle Capital, 50%)	Touissit, Jerada	73,000
Metal[1]		Société des Fonderies de Plomb de Zellidja (SFPZ) (Zellidja S.A., 50.4%)	Oued El Heimer	70,000
Lime		Lafarge Calincor Maroc (Lafarge Group)	Two kilns at Tlad Loulad	180,000
Manganese, concentrate		Société Anonyme Chérifienne d'Etudes Minières (SACEM) [Bureau de Recherches de Participations Minières (BRPM), 43%, and Compagnie Minière de l'Ogooué SA (COMILOG), 30%]	Imini, Ouarzazate	14,000
Natural gas	million cubic meters	Joint venture of Circle Oil Maroc Ltd. (COML), 75%, and Office National des Hydrocarbons et des Mines (ONHYM), 25%	Sebou gasfield	72
Petroleum, refinery products	thousand 42-gallon barrels	Société Anonyme Marocaine de l'Industrie du Raffinage (SAMIR) (Group Corral Petroleum, 64.7%, and general public, 35.3%)	Mohammedia	75,000
Do.	do.	do.	Sidi Kacem	9,500
Phosphate rock		Office Chérifien des Phosphates (OCP) (Government, 100%)	Khouribga-Jorf Lasfar Axis,	19,000,000
Do.		do.	Mera El Arech Mine, Khouribga mining center	6,000,000
Do.		do.	Benguerir open pit mine, Gantour mining center	6,000,000
Do.		do.	Youssoufia underground mine, Gantour mining center	3,000,000
Do.		do.	Sidi Chennane Mine, Khouribga mining center	2,000,000
Phosphoric acid, P_2O_5 content		Office Chérifien des Phosphates (OCP)	Maroc Chimie I and II, Safi	500,000
Do.		do.	Maroc Phosphore I and II, Safi	1,150,000
Do.		do.	Maroc Phosphore III, IV, Jorf Lasfar	1,500,000
Do.		Indo Maroc Phosphore S.A. [Office Chérifien des Phosphates (OCP), 33.33%; Chambal Fertilizers and Chemicals Ltd., 33.33%; Tata Chemicals Ltd., 33.33%]	Jorf Lasfar	430,000
Do.		Bunge Maroc Phosphore (Office Chérifien des Phosphates (OCP), 50%, and Bung Brasil, 50%]	do.	375,000
Do.		Jorf Fertilizer Co. V [Office Chérifien des Phosphates (OCP), 100%]	do.	375,000
Do.		Pakistan Maroc Phosphore S.A. (Office Chérifien des Phosphates (OCP), 50%, and Fauji Pakistani Group, 50%]	do.	375,000
Phosphoric acid (purified), P_2O_5 content		Euro-Maroc Phosphore Co. [Office Chérifien des Phosphates (OCP), 33%; Société Chimique Prayon-Rupel, 33%; Chemische Frabrik Budenheim KG, 33%]	Jorf Lasfar	150,000
Salt:				
Rock		Société de Sel de Mohammedia (SSM) [Office National des Hydrocarbures et des Mines (ONHYM), 100%]	Ain Tekki, Mohammedia	226,500
Marine		Société Chérifienne des Sels (SCS) [Government, 50%, and Société Nouvelle des Salins du Sine Saloum (SNSSS), 50%]	Lac Zima, Safi	30,000
Silver	kilograms	Société Metallurgique d'Imiter (SMI) (Managem S.A., 75.72%, and general public, 24.28%)	Imiter Mine, Imiter	240,000
Do.	do.	Zgounder Millenmium Silver Mining [Maya Gold and Silver Inc., 85%, and Office National des Hydrocarbures et des Mines (ONHYM), 15%]	Zgounder Mine, south of Marrakech	2,500 [2]

See footnotes at end of table.

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TABLE 2—Continued
MOROCCO AND WESTERN SAHARA: STRUCTURE OF THE MINERAL INDUSTRIES IN 2013

(Metric tons unless otherwise specified)

Country and commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
MOROCCO—Continued			
Steel products:			
Bars and sections	Société Nationale de Sidérurgie (Sonasid) (public, 31.14%; Société Nationale d'Ivestissement S.A., 21.07%; Axa Assurances Maroc, 8.53%; Aceralia Redendos, 8.5%)	Jorf Lasfar	300,000
Rebar and wire rod	Univers Acier S.A.	Casablanca	1,000,000
Do.	do.	do.	80,000
Cold-rolled sheet	Maghreb Steel S.A.	do.	250,000
Talc and pyrophyllite:[2]			
Pyrophyllite	Société Industrie Minière Marocaine (IMM)	Khenifra	NA
Talc	Société Zenaga	Tinejdad, Errachidia	NA
Do.	do.	Taliouine, Ouarzazate	NA
Zinc, concentrate	Compagnie Minière de Guemassa (CMG) [Managem S.A., 74%, and Office National des Hydrocarbures et des Mines (ONHYM), 23.08%]	Douar Hajar Mine, Guemassa	170,000
Do.	do.	Draa Sfar	NA
Do.	Société des Mines de Tennous (SOMITE)	Aguerd N'Tazoult, Azilal	NA
Do.	Société Mineral et Substances	Lalla Mimouna, Taza	NA
WESTERN SAHARA			
Cement	Ciments du Maroc S.A. (CIMAR) (Italcementi Group, 58.3%)	Laayoune, grinding	500,000
Phosphate rock	Phosphates de Bou Craa S.A. [Office Chérifien des Phosphates (OCP), 65%]	Open pit mine, Bou Craa mining center	2,000,000

Do., do. Ditto. NA Not available.
[1]Société des Fonderies de Plomb de Zellidja also refines silver and produces copper matte and sodium antimonate.
[2]No production in 2013.

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The Mineral Industry of Mozambique

By Thomas R. Yager

In 2013, Mozambique's share of world ilmenite production was about 6%; zircon, 3%; and aluminum, 1%. The country also played an important role in the world's production of beryl and tantalum. Other domestically important mineral processing operations included cement, coal, and natural gas. Mozambique was not a globally important consumer of minerals or mineral fuels in 2013 (Bedinger, 2015a, b; Bray, 2015; Jaskula, 2015; Papp, 2015).

Minerals in the National Economy

The manufacturing sector accounted for 12% of the gross domestic product in 2012 (the latest year for which data were available), and the mining and quarrying sector, 1.7%. The value of output in the mining and quarrying sector increased by 40.7% in 2012 compared with that in 2011. Employment in the large-scale mining sector was about 15,000 workers in 2012, which included 10,000 in the coal mining subsector. It was estimated that 150,000 workers were employed in artisanal mining operations (Bank of Mozambique, 2013, p. 74, 105–106; World Bank Group, 2013, p. 3–4).

In 2013, national exports were valued at $4.15 billion, of which aluminum accounted for 25.6%; coal, 12.1%; natural gas, 5.5%; and ilmenite, rutile, and zircon, a combined total of 3.7%. By comparison, in 2009, aluminum accounted for 40.4% of the value of national exports; no coal exports were reported (table 1; Bank of Mozambique, 2014, p. 53).

Production

In 2013, the production of limestone increased by 116% compared with that of 2012; gravel and crushed rock, by 102%; lead, by 91%; garnet, by 66%; sand, by 51%; natural gas, by 31%; coal and rutile concentrate, by 28% each; diatomite and ilmenite, by 25% each; beryl, by 23%; and gold, by 11%. The production of dumortierite decreased by 52% in 2013; niobium (columbium), and tantalum, by an estimated 48% each; processed bentonite, by 34%; zircon concentrate, by 33%; bauxite, by 19%; and crude bentonite, by 12% (Eduardo Alexandre, National Director of Mines, Mozambique National Directorate of Mines, written commun., January 23, 2015).

Structure of the Mineral Industry

Most of Mozambique's mining and mineral processing operations were privately owned, including the cement plants, the coal mines, the Marropino and the Muiane tantalum mines, the mineral sands mine, and the aluminum smelter. The Government held a 30% share in the Temane gas project through Empresa Nacional de Hidrocarbonetos E.P. The mineral industry also consisted of a number of small-scale and artisanal operations that produced construction materials, gemstones, gold, niobium (columbium), and tantalum. Capacity, location, ownership, and production information were not readily available for many of these operations (table 2).

Commodity Review

Metals

Aluminum.—Mozambique was Africa's second-ranked producer of aluminum after South Africa in 2013. The Mozal aluminum smelter, which used alumina imported from Western Australia as raw material, produced 562,000 metric tons (t) in 2013 compared with 564,000 t in 2012 (BHP Billiton Ltd., 2013, p. 6; 2014, p. 24).

Gold.—In January 2013, Auroch Minerals NL of Australia acquired the Manica project from Pan African Resources plc of the United Kingdom. Auroch was engaged in a feasibility study on a new mine at Manica. Depending on favorable results of the study, mining could start in 2015. Production was likely to be about 1,200 kilograms per year (kg/yr) of gold. Contained gold resources at Manica were estimated to be about 93,000 kilograms (kg). Republic Gold Ltd. of Australia engaged in drilling at its Mucurumadzi project in the fourth quarter of 2013 (Pick, The, 2013; African Mining, 2014a).

Iron Ore and Vanadium.—In March 2013, Baobab Resources plc of the United Kingdom completed a prefeasibility study with successful results on a new mine located north of Tete. Titaniferous and vanadiferous magnetite from the mine was expected to be smelted into pig iron and ferrovanadium. For the estimated 37-year life of the mine, planned production was 1 million metric tons per year (Mt/yr) of pig iron and 3,200 metric tons per year (t/yr) of ferrovanadium. Baobab planned to complete a feasibility study for the project in 2014. Depending on the results of the study, production was expected to start in 2016. The company was also considering the construction of a new steel plant. Resources at the Tenge-Ruoni deposit at Tete were more than 550 million metric tons (Mt) at a grade of 36% iron (Bain, 2013; Mining Journal, 2013).

Lead.—Gravita Mozambique Lda. (a subsidiary of Gravita India Ltd.) operated a secondary lead refinery in Maputo with a capacity of 3,800 t/yr. In fiscal year 2013 (April 1, 2012, to March 31, 2013), the company's production increased to 1,704 t from 892 t in fiscal year 2012 (Gravita India Ltd., 2013, p. 23).

Niobium (Columbium) and Tantalum.—In August 2013, Noventa Ltd. of the United Kingdom shut down production at the Marropino niobium (columbium) and tantalum mine. Mining operations were subeconomic because of the lack of roads to transport the mine's output and port facilities through which to process radioactive uranium and thorium contained in concentrate, power supply interruptions, and the depletion of high-grade ore near the surface. Ore at greater depths was of lower grade than near the surface and required higher processing costs (Mining Review Africa, 2013).

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On February 29, 2012, Pacific Wildcat Resources Corp. (PAW) of Canada announced the commissioning of its secondary processing plant, which upgraded concentrates produced in the primary plant, at the Muiane Mine. PAW planned to produce between 16,000 and 34,000 kg/yr of tantalum pentoxide (Ta_2O_5) in concentrate after obtaining funds to construct its planned spiral circuit. Indicated resources at Muaine were 1.4 Mt at a grade of 250 grams per metric ton Ta_2O_5 (Pacific Wildcat Resources Corp., 2013, p. 25).

Titanium and Zirconium.—Kenmare Resources plc of Ireland produced ilmenite, rutile, and zircon at the Moma Mine. In 2013, ilmenite concentrate production increased to 720,100 t from 574,400 t in 2012 because of the expansion of Moma's capacity by 50%. Rutile concentrate production increased to 5,100 t from 4,000 t. Zircon concentrate production decreased to 31,400 t in 2013 from 46,900 t in 2012 because of an unexpectedly long shutdown during the capacity expansion process. Kenmare also faced power supply disruptions in the second half of 2013 because of electrical storms and increased power demand by other consumers. The company planned to produce about 900,000 t/yr of ilmenite during the remaining life of the mine. Reserves at Moma were estimated to be 820 Mt at grades of 3% ilmenite, 0.19% zircon, and 0.059% rutile (Kenmare Resources plc, 2014, p. 4, 9, 14, 29, 105).

In May 2011, Pathfinder Minerals plc of the United Kingdom released the results of a scoping study on the Moebase/Naburi project. Pathfinder was considering the development of a new mine that could produce 1.24 Mt/yr of ilmenite, 65,000 t/yr of zircon concentrate, and 24,000 t/yr of rutile concentrate. Capital costs of the project were estimated to be $533 million. In late 2013, the company was engaged in a dispute with JV Consultores Internacionais regarding the rights to the Moebase/Naburi project (Mining Journal, 2011; Pathfinder Minerals plc, 2013).

Industrial Minerals

Beryllium.—African Rare Gemwood mined industrial-grade beryl in northern Mozambique. In 2013, reported national beryl production increased to 654,600 kg from a revised 532,000 kg in 2012. Beryl ores from Mozambique may be exported to the United States for processing.

Cement.—Cimentos de Portugal, SGPS, SA (Cimpor) produced cement at four plants in Dondo, Matola, and Nacala at the start of 2013. The company increased the capacity at its Dondo plant by about 500,000 t/yr from 240,000 t/yr and started a new plant with a capacity of about 100,000 t/yr by yearend (Global Cement Magazine, 2013; Cimentos de Portugal, SGPS, SA, 2014, p. 34).

In 2013, Consolidated General Minerals plc (CGM) of the United Kingdom was building a new cement plant at Beira with a capacity of 800,000 t/yr. CGM planned to start operations at the plant in April 2014 and to ramp up production gradually to about 600,000 t/yr. The company planned to sell its output for domestic consumption and for export to landlocked countries, including Malawi, Zambia, and Zimbabwe (Consolidated General Minerals plc, undated).

National cement consumption was estimated to be 1.8 Mt in 2013, which was an increase of about 10% from 2012. Cimpor's share of the Mozambican market was about 72% in 2013 (Cimentos de Portugal, SGPS, SA, 2014, p. 11, 26).

Fluorspar and Rare Earths.—In late November 2013, Globe Metals & Mining Ltd. of Australia withdrew from exploration at the Mount Muambe fluorite and rare-earths deposit. Globe indicated that Mount Muambe was subeconomic because of the low fluorspar and rare-earth grades, the complex mineralogy of the deposit, and the predominance of low-value rare earths (Globe Metals & Mining Ltd., 2013).

Gemstones.—Gem-quality ruby was found in eluvial and primary deposits in Niassa Province and at Montepuez in Cabo Delgado Province. The Government shut down artisanal mining operations in Niassa in 2009; artisanal miners continued to produce every year during the rainy season when enforcement was much more difficult (Pardieu and Chauvire, 2012).

The Montepuez deposit was discovered in May 2009; Mwiriti Lda. was granted the license for Montepuez shortly after the discovery. In 2011, Mwiriti and Gemfields plc of the United Kingdom formed the joint-venture company Montepuez Ruby Mining (MRM) to mine ruby at Montepuez. MRM's bulk sampling operations started in August 2012; ruby and corundum production amounted to more than 1,000 kg in 2013. The majority of the production was corundum; reported national ruby production was 236 kg in 2013. Gemfields and Mwiriti planned to mine 2,500 kg of ruby and corundum at Montpuez in 2014 (African Mining, 2014b; Eduardo Alexandre, National Director of Mines, Mozambique National Directorate of Mines, written commun., January 23, 2015).

Aquamarine production increased to 645 kg in 2013 from 588 kg in 2012 and 60 kg in 2011. Increased output could be attributable to discoveries of aquamarine by Mozambique Gems Ltd. at Mavuco in northern Mozambique. Rhodolite garnet was mined in Niassa Province; elbaite, in Nampula Province; and rubellite tourmaline, in Zambezia Province (Eduardo Alexandre, National Director of Mines, Mozambique National Directorate of Mines, written commun., January 23, 2015).

Graphite.—The Ancuabe graphite mine in Cabo Delgado Province, which operated from 1994 to 1999, shut down because of high power costs and decreasing graphite prices. At the end of 2013, AMG Advanced Metallurgical Group N.V. of the Netherlands was engaged in a feasibility study on reopening Ancuabe. Depending on the results of the study, AMG could produce 6,000 t/yr of graphite (AMG Advanced Metallurgical Group N.V., 2012; 2014, p. 26).

In the fourth quarter of 2013, Syrah Resources Ltd. of Australia completed a feasibility study on a new mine at the Balama project in northern Mozambique. Depending on financing, Syrah planned to start construction at Balama in the second quarter of 2014 and to start production in the second quarter of 2015. The company planned to produce 220,000 t/yr of concentrates with a content of between 96% and 98% graphite. Total resources at Balama were estimated to be 1.15 billion metric tons at grades of 10.2% graphite and 0.23% vanadium pentoxide (Syrah Resources Ltd., 2013, p. 4–7).

Triton Minerals Ltd. of Australia explored at the Ancuabe and the Balama North projects in 2013. At Balama North, which is located near Syrah's Balama project, Triton engaged in drilling at the Nicanda Hill prospect and rock chip sampling at the

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Cobra Plains prospect. The company also engaged in rock chip sampling at Ancuabe, which is located near the Ancuabe Mine. Triton planned to complete a resource estimate at Cobra Plains in 2014 (Triton Minerals Ltd., 2013).

Mineral Fuels and Related Materials

Coal.—In 2013, Vale S.A. of Brazil planned to reach the full capacity of 8.5 Mt/yr of coking coal and 2.5 Mt/yr of thermal coal at the Moatize Mine in Tete Province. The company's actual production was 3.82 Mt of salable coal in 2013 compared with 3.77 Mt in 2012. Vale also had planned to increase capacity to 22 Mt/yr of salable coal in 2014, of which 17 Mt/yr would be coking coal and 5 Mt/yr would be thermal coal. Expansion plans were delayed by port and rail capacity constraints; the second stage at Moatize was postponed until the second half of 2015. Production was also limited by heavy rains in February (Tex Report, The, 2013d, 2014b).

The Sena Railway was Mozambique's only railway for the export of coal. Sena's capacity was planned to increase to 12 Mt/yr by 2016; a subsequent expansion to 20 Mt/yr was expected to begin in 2017. Vale and Caminhos de Ferro de Mocambique planned to complete a new railway from Tete to the Port of Nacala with an initial hauling capacity of 18 Mt/yr by the end of 2014. The capacity of the Nacala Railway was likely to be increased subsequently to 40 Mt/yr. Vale also planned to complete a new coal-handling terminal at Nacala with an initial capacity of 18 Mt/yr; the capacity was expected to be increased subsequently to 30 Mt/yr (Tex Report, The, 2013d; Beacon Hill Resources plc, 2014, p. 3).

In early 2012, Rio Tinto plc of the United Kingdom and its joint-venture partner Tata Steel Ltd. of India started production at the new Benga Mine, which is adjacent to the Moatize Mine. Rio Tinto and Tata produced 1.62 Mt of salable coal in 2013 compared with 708,000 t in 2012. The companies had planned to mine at the full first-stage capacity of 1.6 Mt/yr of salable coking coal and 800,000 t/yr of salable thermal coal by the end of 2013. Rio Tinto and Tata planned to increase production to 12 Mt/yr in the second stage of mining, of which 6 Mt/yr would be salable coking coal for export, 4 Mt/yr would be salable thermal coal for export, and 2 Mt/yr would be consumed in a new coal-fired power station located near Tete. The second stage of mining was expected to start by 2015. Expansion plans were delayed by port and rail capacity constraints. Rio Tinto planned for the power station to have an initial capacity of between 500 and 600 megawatts (MW) and would eventually increase the capacity to 2,000 MW (African Mining, 2011; Tex Report, The, 2013a, 2014a).

Rio Tinto also planned to develop the Zambeze coal project, which was adjacent to the Benga project. The Government awarded Rio Tinto a mining license for Zambeze in the third quarter of 2013. The company planned to start production at Zambeze between 2023 and 2025. Rio Tinto planned to produce 7 Mt/yr of salable coking coal and 5 Mt/yr of salable thermal coal. The estimated capital cost of the project was $3.3 billion (African Mining, 2013).

Beacon Hill Resources plc (BHR) of the United Kingdom produced 40,923 t of coal at the Minas Moatize Mine in 2013 compared with 54,432 t in 2012. In mid-November, BHR suspended mining because of decreased prices for coking coal. The company increased the capacity at Minas Moatize by 300% in 2013; an additional increase of 56% was planned by the second quarter of 2015. BHR planned to restart production by the third quarter of 2015; the company's quota for exporting coal on the Sena Railway was 500,000 t, or 7.7% of capacity, whichever was greater (Beacon Hill Resources plc, 2014, p. 7, 10, 18).

Jindal Steel & Power Ltd. of India started mining coal at its Chirodzi project in western Tete Province in November 2012. The company planned to produce 3 Mt/yr of coal in the first phase of the project; output could increase to 10 Mt/yr in a subsequent phase. Coking coal from Chirodzi was expected to be consumed in Jindal's steel plants in India, and thermal coal, at a new coal-fired power station in Mozambique, which would have a capacity of 2,640 MW. Jindal planned to export 1 Mt of coal in 2013; the company hoped to obtain a shipping quota on the Sena railway because of the difficulty and expense of transporting coal to Beira by truck (Tex Report, The, 2013b).

In the fourth quarter of 2013, Ncondezi Coal Company Ltd. of the United Kingdom completed its revised feasibility study on a new mine and coal-fired power station with favorable results. Ncondezi Coal planned to start construction of the mine and the 300-MW-capacity power station in 2015; commissioning for the mine and power station was planned for the second half of 2017. The power station was expected to consume about 1.5 Mt/yr of thermal coal. Ncondezi Coal planned to increase the capacity of the power station in increments of 300 MW until it reaches the final capacity of 1,800 MW. Thermal coal production would increase to 9 Mt/yr for consumption in the power station. The estimated life of the mine was more than 25 years (Ncondezi Coal Company Ltd., 2014, p. 2, 4).

Midwest Africa Ltd. (MAL) of India planned to start production at a new mine in the Moatize District in Tete Province by 2019. At full capacity, production was likely to be 6 Mt/yr of thermal coal and 1 Mt/yr of coking coal. MAL estimated that reserves were 480 Mt of coal. The estimated capital cost of the project was $3.3 billion. The Government granted a mining license to MAL in 2013 (African Mining, 2013).

In April 2013, Nippon Steel & Sumitomo Metal Corp. (NSSMC) of Japan received a mining license for the Revuboe project, which is adjacent to the Moatize Mine. By 2016, NSSMC and the POSCO Group of the Republic of Korea planned to start mining at Revuboe. Planned production was 5 Mt/yr of coking coal, which would be exported, including to Japan and the Republic of Korea. Anglo American plc of the United Kingdom canceled plans to purchase a 58.9% share in Revuboe in late March. NSSMC and POSCO were seeking a new joint-venture partner in mid-2013 (Tex Report, The, 2013c).

Natural Gas.—Production of natural gas from the Pande and the Temane gasfields increased to nearly 5.01 billion cubic meters in 2013 from a revised 3.84 billion cubic meters in 2012. Sasol Ltd. of South Africa, which operated the project, exported most of its output through a pipeline to supply its South African chemical plants. Natural gas was also supplied to the power station at Ressano Garcia. The capacity at the processing plant

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for Pande and Temane was 4.78 billion cubic meters per year. At the end of June, reserves were estimated to be about 43 billion cubic meters (Sasol Ltd., 2013, p. 50–51, 109).

In 2013, Aggreko plc of the United Kingdom and its joint-venture partner Shanduka Group of South Africa increased the capacity at Ressano Garcia to 232 MW from 110 MW. The original 110 MW of capacity supplied power to Eskom of South Africa and Electricidade de Mocambique (EDM). Aggreko signed an agreement to allocate 90 MW of the new capacity to supply NamPower of Namibia and 32 MW to supply EDM for at least 2 years (Cameron, 2013).

Anadarko Petroleum Corp. of the United States and its joint-venture partners held the exploration rights for Offshore Area 1, which is located in the Rovuma Basin. As of mid-2013, natural gas in place in Offshore Area 1 was estimated to be 2.83 trillion cubic meters, of which between 990 billion cubic meters and 1.84 trillion cubic meters was reserves. Eni S.p.A. of Italy and its joint-venture partners held the exploration rights for Offshore Area 4; estimated natural gas in place in Offshore Area 4 was 2.27 trillion cubic meters as of mid-2013 (Brower, 2013; Quinlan, 2013).

Anadarko and Eni were considering the development of a liquefied natural gas (LNG) plant at Palma in Cabo Delgado Province that would use natural gas from Offshore Areas 1 and 4. The initial capacity of the plant could be 5 Mt/yr (6.9 billion cubic meters per year of natural gas) or 10 Mt/yr; capacity was likely to be increased to 20 Mt/yr. The companies were expected to start production in 2018 or 2019 and to increase output to 20 Mt/yr by the early 2020s. Anadarko could make an investment decision by the end of 2014 (Brower, 2013).

In 2013, Petronas Carigali Overseas Sdn Bhd of Malaysia and Total S.A. of France explored for natural gas in Offshore Areas 3 and 6. Statoil ASA of Norway explored in Offshore Areas 2 and 5 (Brower, 2013).

Outlook

The mineral sector of Mozambique is likely to have substantial growth in the near future. Growth is expected to be broadly based, with increased production of ilmenite, rutile, and zircon planned for 2014; cement, for 2014 through 2016; coal, for 2014 through 2025; gold, for 2015 through 2017; and natural gas, for 2019 through 2025. A new iron ore and vanadium mine could open in 2016. Graphite production could also restart. Niobium and tantalum production is expected to decrease in 2014 because of the closure of the Marropino Mine.

The outlook for coal, gemstones, ilmenite, natural gas, rutile, and zircon will likely depend heavily upon conditions in the world economy. Increases in coal production also will depend on the expansion of the port handling capacities and the rail network. The development of new mines and related infrastructure could lead to increased consumption and production of local construction materials.

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TABLE 1
MOZAMBIQUE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
Aluminum:						
Bauxite		3,612	8,556	10,352	8,352	6,761
Metal, refined		545,000	557,000	562,000	564,000	562,000
Beryl	kilograms	45,100	56,700	57,800	532,000 r	654,600
Cement, hydraulic[3]	thousand metric tons	777	884	976	1,184	1,299
Clays:						
Bentonite:						
Crude		92,098	11,417	423	24,000	21,135
Processed		577	459	493	1,459	968
Brick		15,661	43,143	99,561	100,000 e	100,000 e
Coal, bituminous		25,924	38,260	648,220	4,954,000 r	6,343,400
Diatomite		213	123	48	541	675
Gemstones:						
Aquamarine	kilograms	592	1,579	60	588	645
Dumortierite		63	27	58	58	28
Garnet	kilograms	2,648	16,355	174,928 r	170,980 r	283,175
Morganite[e]	do.	2,600	--	--	--	--
Ruby	do.	NA	NA	NA	NA	236
Tourmaline	do.	6,078	14,669	26,279	513,654 r	520,000 e
Gold[4]	do.	511	106	111	178	198
Lead, secondary refined[e, 5]		400	600	800	892 6	1,704 6
Natural gas	million cubic meters	2,833	3,261	3,438	3,837 r	5,008
Niobium (columbium) and tantalum, columbite-tantalite, ore and concentrate:						
Gross weight	kilograms	404,668	55,054	139,145	407,734 r	210,746
Nb content[e]	do.	29,000	3,900	10,000	29,000 r	15,000
Ta content[e]	do.	113,000	15,000	39,000	110,000 r	57,000
Quartz	do.	140,600	707,411	838,684	51,750 r	56,599
Salt, marine[e]		110,000	120,000	120,000	130,000	130,000
Sand		1,260,492	1,150,052	1,678,736	2,137,613 r	3,237,285
Steel, semimanufactured		20,000 e	--	--	--	--
Stone:						
Granite[e]	cubic meters	350	--	--	--	--
Gravel and crushed rock	do.	2,942,830	824,316	951,069	1,007,802 r	2,032,191
Limestone		234,135	263,908	415,883	1,322,424 r	2,856,999
Marble:						
Block	cubic meters	--	--	225,144	230,000 e	230,000 e
Slab	square meters	250	--	-- e	-- e	-- e
Titanium:						
Ilmenite concentrate		471,500	678,400	636,800	574,400 r	720,100
Rutile concentrate		1,800	4,700	6,455	4,000 r	5,100
Zircon concentrate		21,100	37,100	43,600	46,900	31,400

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. do. Ditto. NA Not available. -- Zero.

[1]Table includes data available through February 27, 2015.

[2]Other gemstones were produced, but available information is insufficient to estimate production.

[3]Reported cement sales by Cimentos de Moçambique SARL only.

[4]Does not include unreported production; total output of gold was estimated to be roughly 600 to 900 kilograms per year.

[5]Fiscal year ending on March 31 of calendar year.

[6]Reported figure.

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TABLE 2
MOZAMBIQUE: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[1]
Aluminum		Mozambique Aluminum SARL (BHP Billiton Ltd., 47.1%; Mitsubishi Corp., 25%; Industrial Development Corp. of South Africa Ltd., 24%)	Mozal smelter at Beluluane	563,000.
Bauxite		Mina Alumina Lda.	Vila de Manica	12,000.[e]
Bentonite		Minerais Industriais de Moçambique Lda.	Mine at Mufiane	30,000.
Beryl		African Rare Gemwood	Mine in Zambezia Province	NA.
Cement		Cimentos de Moçambique SARL [Cimentos de Portugal, SGPS, SA (Cimpor), 82.46%]	Plant at Matola	1,520,000.
Do.		do.	Plant at Dondo	740,000.
Do.		do.	Plant at Nacala	200,000.[e]
Do.		do.	Plant at Maputo	100,000.
Do.		Cimentos de Nacala S.A. [Cimentos de Portugal, SGPS, SA (Cimpor), 100%]	Plant at Nacala	350,000.
Coal, bituminous		Vale S.A.	Moatize Mine near Tete	11,000,000.
Do.		Jindal Steel & Power Ltd.	Chirodzi Mine in Tete Province	3,000,000.
Do.		Rio Tinto plc, 65%, and Tata Steel Ltd., 35%	Benga Mine near Tete	2,400,000.
Do.		Beacon Hill Resources plc (BHR)	Minas Moatize Mine near Tete[2]	880,000.
Diatomite		Diatomites de Moçambique Lda	Diana quarry near Manica	4,800.
Gemstones:				
Aquamarine	kilograms	Mozambique Gems Ltd.	Mine near Mavuco	3,600.[e]
Garnet	do.	Sociedade Vision 2000 Lda	Cuamba Mine	8,000.[3]
Morganite	do.	Noventa Ltd.	Mine at Marropino[2]	5,000.[e]
Ruby	do.	Montepuez Ruby Mining (MRM) (Gemfields plc, 75%, and Mwiriti Lda., 25%)	Montepuez Mine in Cabo Delgado Province	1,000.[e]
Do.	do.	Artisanal miners	Nacaca Mine in Cabo Delgado Province	NA.
Do.	do.	do.	M'sawize Mine in Niassa Province	NA.
Tourmaline	do.	do.	13 kilometers northeast of Mavuco[2]	2,600.[e]
Do.	do.	do.	3 kilometers northeast of Mavuco[2]	NA.
Do.	do.	Mozambique Gems Ltd.	Mine near Mavuco	1,200.[e]
Do.	do.	Miranda Gems Hong Kong Ltd.	do.	NA.
Gold	do.	Artisanal miners	Manica District	600.
Lead, refined		Gravita Moçambique Lda. (Gravita India Ltd., 100%)	Plant at Maputo	3,800.
Marble, block	cubic meters	Marmonte Mozambique	Quarry at Pemba[2]	1,500.
Natural gas	million cubic meters	Sasol Ltd., 70%, and Empresa Nacional de Hidrocarbonetos, E.P., 30%	Temane and Pande	4,780.
Niobium (columbium) and tantalum, columbite-tantalite, ore and concentrate		Noventa Ltd.	Mine at Marropino[2]	270 Ta_2O_5.
Do.		Pacific Wildcat Resources Ltd.	Mine at Muiane	34 Ta_2O_5.
Steel, semimanufactured		ArcelorMittal South Africa Ltd.	Trem de Varao plant at Maputo[2]	35,000.
Titanium		Kenmare Resources plc	Moma Mine in Nampula Province	1,200,000 ilmenite; 21,000 rutile concentrate.
Zirconium		do.	do.	75,000 zircon concentrate.

[e]Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.
[1]Abbreviations used in this table for commodities include the following: Ta_2O_5—tantalum pentoxide.
[2]Not operating at the end of 2013.
[3]Gem-quality only.

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The Mineral Industry of Namibia

By Omayra Bermúdez-Lugo

The diamond sector continued to be a significant contributor to Namibia's economy. In 2013, although Namibia accounted for less than 2% of world rough diamond production by weight (carats), it ranked number one in terms of the value per unit weight in dollars per carat. The average value of Namibia's diamond was about $805 per carat; this value was nearly $220 more than the value per unit weight of diamond from Lesotho, which was the world's second-ranked diamond producer by value per unit weight in 2013. Namibia's total diamond exports were valued at $1 billion in 2013. The country was also the world's fifth-ranked producer of uranium, accounting for about 7.3% of world output in 2013. Metals produced in Namibia included arsenic, copper, gold, lead, manganese, silver, and zinc concentrates. In addition to diamond, other industrial minerals produced in the country included cement, dolomite, fluorspar, granite, marble, salt, semiprecious stones, and wollastonite (Kimberley Process Rough Diamond Statistics, 2014; World Nuclear Association, 2014).

The Namibian economy was estimated to have grown by 5.1% in 2013. This was partly attributed to an increase in construction projects in the mineral sector led by private industry and to an increase in diamond output, although improved performance in nonmineral-related sectors of the economy was also reported as a contributing factor. Namibia's mineral sector contribution to gross domestic product, as reported by the Namibia Statistics Agency, was estimated to be 13% in 2013. In terms of real value added, the mineral sector as a whole increased by an estimated 0.6% compared with 25.1% in 2012. The sector's decrease in performance resulted from lower output by most of Namibia's mineral producers, with the exception of cement, lead concentrates, and diamond (table 1; Namibia Statistics Agency, 2014, p. 12, 15, 22).

Cement output increased by about 32% to 662,000 metric tons (t) and lead concentrate by 17% to 20,551 t. Diamond production, as reported by the Kimberley Process Certification Scheme, increased by about 4% to nearly 1.7 million carats. Production of copper concentrates decreased by about 10% to 20,646 t containing 4,896 t of copper. The decrease in the production of copper concentrates was attributed to the temporary shutdown of the Matchless Mine and to problems with ground subsidence at the Otjihase Mine, which impeded the recovery of ore from the affected area. The Matchless Mine was temporarily shut down in April 2013 as a result of a safety audit of the mine's electrical facilities following the death of a mining contractor at the facility in March (Chamber of Mines of Namibia, 2014, p. 6, 62; Kimberley Process Rough Diamond Statistics, 2014; Weatherly International plc, 2014, p. 6, 9).

Gold production decreased by 14.9% to 1,960 kilograms, mostly as a result of the mining of lower grade ore; production of zinc in concentrate and zinc metal decreased by 5.3% and 14%, respectively, owing to the mining of lower grade ore at the Skorpion zinc mine and to the unplanned maintenance shutdown of the Namzinc refinery. Estimated fluorspar production data were based on trade information. The latest reported data available for dolomite, granite, and marble output were for 2011. Production data for semiprecious stones and wollastonite were inadequate to make reliable estimates of output. Data on mineral production are in table 1 (AngloGold Ashanti Ltd., 2014, p. 68; Vedanta Resources plc, 2014, p. 53).

Mineral development projects underway included United Kingdom-based Weatherly International plc's 17,000-metric-ton-per-year (t/yr) copper cathode Tschudi project; Canada-based B2Gold Corp.'s 3,300- to 4,400-kilogram-per-year Otjikoto gold mine, which was on schedule to be commissioned during the fourth quarter of 2014; Canada-based Dundee Precious Metals Inc.'s 340,000-t/yr sulfuric acid plant; and Namibia-based Swakop Uranium's Husab uranium mine. Weatherly invested $2.7 million in 2013 to complete a feasibility study for the Tschudi project. The company also secured full funding for the development of the project through the signing of a $91 million loan to be provided by Orion Mine Finance Fund 1 on September 19. Kombat Copper Inc. of Canada continued with its plans to reopen the Kombat copper mine, which was closed in 2008 as a result of problems with flooding caused by the irregular supply of electricity to the processing plant. The company planned to complete a preliminary economic assessment of the project during the first half of 2014 (B2Gold Corp., 2013; Dundee Precious Metals Inc., 2013; Kombat Copper Inc., 2014, p. 5; Weatherly International plc, 2014, p. 4, 68).

The total number of people employed in mining in Namibia in 2013, including temporary employees and full-time contractors, was 16,709. About 23% of the 7,126 people permanently employed in the mineral sector worked for Namdeb Holdings (Pty.) Ltd., 16% for Rössing Uranium Ltd., and 10% for Skorpion Mining Co. (Pty.) Ltd. and Namzinc (Pty.) Ltd. (Chamber of Mines of Namibia, 2014, p. 11–12, 86–87).

Table 1 provides data on the principal mineral commodities produced in Namibia from 2009 to 2013, and table 2 provides a list of major mineral industry facilities in 2013. More-extensive coverage of the mineral industry of Namibia can be found in the 2011 and 2012 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East (available on the Internet at http://minerals.usgs.gov/minerals/pubs/country/africa.html#na).

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TABLE 1
NAMIBIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
METALS						
Arsenic, white, 99% arsenic trioxide[e]		860	1,280	1,750	1,590	1,520
Copper:						
Mine output, concentrate (26%–30% Cu):						
Gross weight		--	--	13,553	23,032	20,646
Cu content		--	--	3,366	5,304	4,896
Metal blister; from domestic and imported concentrates		21,543	31,900	43,800	39,800	38,100
Gold, Au content of mine output[3]	kilograms	2,022	2,675	2,053	2,302	1,960
Lead, mine output, concentrate:						
Gross weight		20,258	19,202	15,776	17,557	20,551
Pb content of Pb and Pb-Zn concentrates		10,129	10,301	9,139	10,000 r,e	11,000 e
Manganese, mine output, concentrate (44% Mn):						
Gross weight[4]		62,100	104,300	109,900	176,200	174,400
Mn content[e]		27,300	45,900	48,400	77,500	76,100
Silver:						
Mine output, Ag content of concentrates[e]	kilograms	43,500 r	44,700 r	44,300 r	47,000 r	45,100
Metal, refined, primary[e, 5]	do.	11,800	17,500	24,100	21,900	21,000
Zinc:						
Zn content of ore and concentrates (52% Zn)		197,400 r	204,229 r	192,173 r	194,380 r	184,109
Metal, refined, primary		150,400	151,688	145,639	145,342	124,924
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	--	5 e	390	501	662
Diamond[6]	thousand carats	1,192	1,693	1,256	1,629	1,689
Fluorspar, acid grade (97% CaF_2)[7]		73,580	95,092	84,480	67,500 e	61,400 e
Salt		807,348	770,636	738,000	725,000	717,612
Stone:						
Dolomite		27,000 e	33,822	33,800	34,000 e	34,000 e
Granite		34,869	10,742	15,312	15,000 e	15,000 e
Marble		11,008	8,584	9,330	9,000 e	9,000 e
Sulfur, pyrite concentrate:						
Gross weight (49% to 51% S)		--	--	-- r	-- r	--
S content		--	--	-- r	-- r	--
Uranium oxide, U content		4,626	4,496	3,258	4,495	4,323

See footnotes at end of table.

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TABLE 1—Continued
NAMIBIA: PRODUCTION OF MINERAL COMMODITIES[1]

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. -- Zero.
[1]Table includes data available through December 30, 2014.
[2]In addition to the commodities listed, Namibia produced semiprecious stones such as agate, aquamarine, amethyst, basalt, blue chalcedony, lead dusts, picture stone, pietersite, rose quartz, sand and gravel, sepiolite, smokey quartz, topaz, tourmaline, and wollastonite but available information was inadequate to make reliable estimates of output.
[3]Excludes gold recovered as a byproduct of copper mining.
[4]Reported by the International Manganese Institute.
[5]Includes products of imported concentrate.
[6]Reported by the Kimberley Process Certification Scheme.
[7]Production data prior to 2011 were for acid grade. Beginning in 2011, data include an unspecified amount of metallurgical grade fluorspar. Data are reported in dry metric tons.

TABLE 2
NAMIBIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Arsenic	Namibia Custom Smelters (Pty.) Ltd. (Dundee Precious Metals Inc., 100%)	Smelter at Tsumeb, 430 kilometers north of Windhoek	2,000
Cement	Ohorongo Cement (Pty) Ltd. (Schwenk Zement KG, 60%; Industrial Development Corp., 20%; Bank of Namibia, 10%)	Otjozondjupa region, near Otavi	700,000
Copper:			
Copper concentrates	Ongopolo Mining Ltd. (Weatherly International plc, 97.5%, and Labour Investment Holdings, 2.5%)	Central operations, includes the Otjihase Mine and concentrator, about 30 kilometers north of Windhoek; and the Matchless Mine, 80 kilometers southwest of the Otjihase Mine	7,000,000
Metal, blister copper	Namibia Custom Smelters (Pty.) Ltd. (Dundee Precious Metals Inc., 100%)	Smelter at Tsumeb, 430 kilometers north of Windhoek	60,000
Diamond carats	Namdeb Holdings (Pty) Ltd. (NHPL) (De Beers UK Ltd., 50%, and the Government, 50%)	Atlantic 1 license area, offshore Sperrgebiet	1,200,000
Do. do.	do.	Mining Area 1, from Orange River to 145 kilometers north of Orangemund; includes Pocket Beaches	252,000
Do. do.	do.	Northern Areas and Elizabeth Bay Mines, 24 kilometers south of Luderitz	210,000
Do. do.	do.	Orange River Mines, from mouth of Orange River east to Sendelingsdrif; includes the Auchas and the Daberas Mines	76,000
Do. do.	do.	Alluvial contractors	22,000
Do. do.	Sakawe Mining Corp. (Samicor) (LL Mining Corp., 76%, and Government, 8%)	Offshore mining licenses, near Luderitz Bay	260,000
Fluorspar, acid grade	Okorusu Fluorspar (Pty.) Ltd. (Solvay Fluor GmbH, 100%)	Mine and plant at Okorusu	120,000
Gold:			
Ore	AngloGold Ashanti Ltd.	Navachab Mine, 170 kilometers northwest of Windhoek	1,440,000
Metal kilograms	Namibia Custom Smelters (Pty.) Ltd. (Dundee Precious Metals Inc., 100%)	Coproduct contained in blister copper produced at the copper smelter at Tsumeb	400
Lead, Pb content of concentrate	Rosh Pinah Zinc Corporation (Pty.) Ltd. (GlencoreXstrata plc, 80%)	Rosh Pinah Mine, near Rosh Pinah	20,000
Manganese	Otjozondu Mining (Shaw River Manganese Ltd., 100%)	Otjozondu Mine, 150 kilometers northeast of Windhoek	120,000
Pyrite, concentrate	Weatherly Mining Namibia Ltd. (Weatherly International plc, 100%)	Otjihase Mine and concentrator, near Tsumeb	32,000

See footnotes at end of table.

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TABLE 2—Continued
NAMIBIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Salt	Cape Cross Salt (Pty.) Ltd.	North of Henties Bay	40,000
Do.	Salt & Chemicals (Pty.) Ltd. [Walvis Bay Salt Holdings (Pty.) Ltd., 100%]	Salt pan at Walvis Bay	670,000
Do.	Salt Company (Pty.) Ltd.	Swakopmund	120,000
Do.	Walvis Bay Salt Refiners (Pty.) Ltd. [Walvis Bay Salt Holdings (Pty.) Ltd., 100%]	Salt refinery at Walvis Bay	650,000
Silver:			
Concentrate, Ag content	Rosh Pinah Zinc Corporation (Pty.) Ltd. (GlencoreXstrata plc., 80.1%)	Rosh Pinah Mine, near Rosh Pinah	25
Metal	Namibia Custom Smelters (Pty.) Ltd. (Dundee Precious Metals Inc., 100%)	Joint product contained in blister copper produced at the copper smelter at Tsumeb	25
Uranium, uranium oxide	Langer Heinrich Uranium (Pty.) Ltd. (Paladin Energy Ltd., 100%)	Langer Heinrich Mine. 80 kilometers east of Walvis Bay	2,400
Do.	Rössing Uranium Ltd. (Rio Tinto Group, 69%; Government of Iran, 15%; Industrial Development Corp. of South Africa Ltd., 10%; Government of Namibia, 3%; other minority shareholders, 3%)	Rössing Mine, 65 kilometers northeast of Swakopmund	4,800
Wollastonite	Namibia Mineral Development Co. (Pty.) Ltd.	Usakos Mine	800
Zinc:			
Mine:			
Concentrate, Zn content	Rosh Pinah Zinc Corporation (Pty.) Ltd. (GlencoreXstrata plc., 80.1%)	Rosh Pinah Mine, near Rosh Pinah	110,000
Ore	Skorpion Zinc (Pty.) Ltd. (Vedanta Resources plc, 100%)	Skorpion Mine, 25 kilometers north of Rosh Pinah	1,500,000
Metal	Namzinc (Pty.) Ltd. (Vedanta Resources plc, 100%)	Skorpion solvent extraction facilities and electrowinning refinery, 25 kilometers north of Rosh Pinah	150,000

Do., do. Ditto.

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The Mineral Industry of Nigeria

By Philip M. Mobbs[1]

As Africa's leading crude oil producer, Nigeria accounted for 26.6% of African and about 2.7% of total world crude oil production in 2013. The state-owned Nigerian National Petroleum Corp. (NNPC) reported that crude oil and condensate output in 2013 decreased to 800.5 million barrels (Mbbl) from about 852.8 Mbbl in 2012 (BP p.l.c., 2014, p. 10; Nigerian National Petroleum Corp., 2014, p. 29).

The Federal Government holds all mineral rights and is responsible for issuing exploration and development licenses. The Minerals and Mining Act, 2007; the Minerals and Mining Regulations, 2011; and the Petroleum Act of 1969 form the legal basis for exploration and production activity in the mineral sector.

Minerals in the National Economy

In 2013, the Nigerian hydrocarbon sector, which included the production of crude oil, natural gas, and refined petroleum products, accounted for 13.2% of the nominal GDP at market price (which was $513 billion).[2] The contribution to the GDP of other minerals-related activity included the construction sector, which accounted for 3.3% of the GDP; the manufacturing and distribution of cement, 0.6%; the manufacturing and distribution of basic metals (primarily iron and steel), 0.2%; and the production of coal, metal ores, and other minerals, 0.1% (table 1; National Bureau of Statistics, 2014b).

The Nigerian hydrocarbon sector accounted for about 75% of Government revenue. Exports of natural gas and petroleum accounted for about 95% of total Nigerian exports (which were valued at $88 billion). Crude oil exports accounted for 82.9% of total exports. In 2013, total imports into Nigeria were valued at $43 billion, of which refined petroleum products accounted for 16% (International Monetary Fund, 2014, p. 10; National Bureau of Statistics, 2014a, p. 9, 15).

Production

In addition to crude and refined hydrocarbons, Nigeria produced a small suite of minerals, which included barite, coal, gemstones, gold, iron ore, niobium, salt, sand, stone, tantalum, and tin, and some mineral-based commodities, such as aluminum, cement, nitrogenous fertilizers, and steel. The production of refined petroleum products was estimated to have increased by 29% in 2013, and natural gas liquids, by 18%. In 2013, the production of aluminum decreased by 92%; lead-zinc ores, by 33%; iron ore, by 29%; and natural gas, by 18% (table 1).

Structure of the Mineral Industry

The Ministry of Mines and Steel Development (MMSD) manages much of the solid minerals sector. The Nigerian Mining Cadastre Office, which is a department of the MMSD, processes mineral title applications, including exploration licenses, mining licenses, quarrying licenses, and small-scale mining licenses. The Nigerian Geological Survey Agency (NGSA) explores mineral deposits and collects geoscience information. Small-scale artisanal miners operated most of the mines and quarries. Nigeria also had a large ferrous and nonferrous metal recycling sector.

The Federal Ministry of Petroleum Resources is responsible for the oversight of the natural gas and petroleum sectors. The NNPC was the major partner in natural gas and petroleum production joint ventures, which were operated by subsidiaries of large international oil companies or domestic oil companies. Crude oil also was produced under production-sharing contracts, service contracts, and by sole risk operators (primarily independent domestic companies). Government-operated refineries accounted for more than 99% of national petroleum refining capacity. Most Nigerian natural gas output was associated with crude oil production.

Commodity Review

Metals

Aluminum.—Aluminum Smelter Co. of Nigeria, Ltd. (ALSCON), which was a joint venture of United Company RUSAL Plc of Russia and the Government, produced about 2,000 metric tons of aluminum in 2013, which was about 2% of nameplate capacity. The lack of a reliable supply of natural gas to operate the smelter's powerplant, ongoing ownership issues, transportation issues that affected alumina imports and aluminum ingot exports, and the poor world market for aluminum continued to adversely affect operations. BFIG Group Divino Corp. of the United States continued its litigation concerning the validity of BFIG's contract to acquire ALSCON in 2004 (Odey, 2013; United Company RUSAL Plc, 2014, p. 32, 53).

Iron Ore.—In 2013, KCM Mining Ltd., which was a subsidiary of Kogi Iron Ltd. of Australia, completed a reverse circulation drill program on the Agbaja project. Kogi subsequently initiated an environmental and social impact assessment study and a prefeasibility study of the project that were expected to be completed in early 2014. The company also planned to complete a feasibility study by the end of 2014. Depending on the results of the studies, Kogi could produce 5 million metric tons per year of iron ore at Agbaja starting in late 2016 or early 2017. The Agbaja magnetite deposit was located about 15 kilometers north of Lokoja, Kogi State (Kogi Iron Ltd., 2014).

[1]Deceased.

[2]Where necessary, values have been converted from Nigerian naira (NGN) to U.S. dollars (US$) at an average rate of NGN158=US$1.00 for 2013.

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Mineral Fuels

Petroleum.—In 2013, companies affiliated with Exxon Mobil Corp. of the United States, which included Esso Exploration and Production Nigeria Ltd. and the Mobil Producing Nigeria Unlimited joint venture with NNPC, accounted for about 30% of Nigerian crude oil production. Associated companies of Royal Dutch Shell plc, which included Shell Nigeria Exploration and Production Co. and the Shell Petroleum Development Company of Nigeria Ltd. joint venture with NNPC, accounted for 22% of crude oil production. Affiliated companies of Chevron Corp. of the United States, which included the Chevron Nigeria Ltd. (CNL) and the NNPC joint venture, the Chevron (Pennington) operation, and Star Deep Water Petroleum Ltd., accounted for about 20% of crude oil production (Nigerian National Petroleum Corp., 2014, p. 3).

Reported incidents of crude oil and refined petroleum product pipeline vandalization increased to 3,505 incidents in 2013 from 2,320 incidents in 2012. Stolen crude oil was smuggled through the Niger River Delta to small tankers anchored offshore or was illegally refined in the delta region for local consumption. The small (30- to 150-barrel-per-day) refineries, which operated intermittently (primarily at night to avoid detection by Government forces), typically produced diesel fuel, gasoline, and kerosene. In 2013, the Ministry of Defense's Joint Task Force destroyed 1,951 illegal refineries compared with 3,778 refining camps destroyed in 2012. Reported pipeline ruptures, which were associated with mechanical and structural failures of the pipelines, increased to 65 occurrences in 2013 from 26 in 2012 (Niyi, 2013; Onuorah, 2013; Stakeholder Democracy Network, 2013, p. 15–19; Nigerian National Petroleum Corp., 2014, p. 68).

American imports of Nigerian hydrocarbons continued to decrease in 2013. About 102.6 Mbbl of Nigerian crude oil and petroleum products were exported to the United States in 2013 compared with 161.6 Mbbl in 2012 and 413.9 Mbbl in 2007. Crude oil accounted for 85.2% of these exports in 2013, 91.9% in 2012, and 95.6% in 2007. The dramatic decrease in crude oil exports to the United States was attributed to lower demand for imported oil owing to increased production of oil from shale formations in the United States. In the past few years, increased volumes of Nigerian crude oil had been shipped to Europe, especially to France, Italy, the Netherlands, and the United Kingdom (Lidji, 2012; Nigerian National Petroleum Corp., 2014, p. 32; U.S. Energy Information Administration, 2014a, b).

Outlook

For the past few years, the Government's ongoing promotion of the diversification of the mineral sector has become more important because crude oil revenues have decreased. The NGSA has increased its mineral exploration activity. The MMSD identified barite, bitumen, coal, gold, limestone, iron ore, lead, and zinc as strategic minerals that are to be targeted for priority development. The intermittent availability of electrical power, however, is expected to continue to affect mineral-processing and other businesses in Nigeria. Corruption, high local-community expectations, ongoing issues concerning the privatization of former state-owned enterprises, illegal mining and associated environmental damage, inadequate availability of funding for mineral projects, poor transportation infrastructure, and security issues in various parts of the country also adversely affect mineral-related activity (U.S. Department of State, 2013; KPMG Advisory Services, 2014, p. 2, 12).

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TABLE 1
NIGERIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1,2]

(Metric tons unless otherwise specified)

Commodity[3]		2009	2010	2011	2012	2013
METALS						
Aluminum		13,000	21,200	17,600	26,000	2,000 [4]
Gold	kilograms	1,350	3,718 [4]	4,000	4,000	4,200
Iron and steel:						
Iron ore, gross weight	thousand metric tons	99 [4]	63 [4]	70 [4]	70	50
Steel		100,000	100,000	100,000	400,000	400,000
Lead-zinc ore		530,000	680,000	800,000	600,000	400,000
Niobium (columbium) and tantalum concentrates:						
Gross weight		331	281	311	310	300
Niobium (columbium) content		23	20	22	22	21
Tantalum content		68	58	64	63	60
Tin, mine output, cassiterite concentrate:						
Gross weight		510	680	740	740	740
Sn content		400	520	570	570	570
INDUSTRIAL MINERALS						
Barite[5]		19,400 [4]	13,249 [r,4]	4,988 [r,4]	10,000 [r]	10,000
Cement, hydraulic	thousand metric tons	10,000	11,000	12,800	16,400	18,000
Clays, includes kaolin		154,000 [4]	139,000 [4]	155,000 [4]	140,000	140,000
Feldspar		1,700	1,616 [4]	1,700	1,700	1,700
Gypsum		300,000	320,000	320,000	350,000	350,000
Nitrogen, N content of ammonia		40,000	95,000	80,000	240,000	240,000
Sand and stone:						
Laterite	thousand metric tons	2,740 [4]	2,322 [4]	2,573 [4]	2,600	2,500
Limestone	do.	4,237 [4]	5,671 [4]	8,280 [4]	11,000	12,000
Marble	do.	190	--	--	--	--
Sand, construction	do.	1,050 [4]	1,254 [4]	1,394 [4]	1,400	1,400
Sand, industrial (silica)	do.	32	30	30	30	30
Stone, crushed (aggregate):						
Granite	do.	10,104 [4]	7,739 [4]	9,621 [4]	10,000	10,000
Marble	do.	8,995 [4]	9,356 [4]	10,185 [4]	10,000	10,000
Other	do.	3,762 [4]	3,673 [4]	4,074 [4]	4,000	4,000
Shale	do.	7,235 [4]	6,690 [4]	7,452 [4]	9,000	9,000
Topaz	kilograms	1,077 [4]	1,000	1,000	900	900
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous		40,612 [4]	45,713 [4]	39,213 [4]	40,000	40,000
Natural gas:[4]						
Gross	million cubic meters	52,026	67,758	67,972	73,063	65,869
Marketed[6]	do.	24,413	45,903	38,343	37,946	31,231
Petroleum:						
Crude and condensate[4]	thousand 42-gallon barrels	780,348	896,043	866,245	852,777	800,488
Natural gas liquids	do.	15,500	14,700	18,600	15,700	18,573 [4]
Refinery products:						
Liquefied petroleum gases	do.	1,200	1,900	1,200	1,000	1,880 [4]
Gasoline	do.	3,102 [4]	6,400	10,900	9,700	10,500 [4]
Kerosene	do.	2,530 [4]	5,000	5,800	4,700	5,790 [4]
Distillate fuel oil	do.	4,168 [4]	7,000	8,200	7,200	7,600 [4]
Residual fuel oil	do.	4,060 [4]	6,600	9,300	6,500	8,960 [4]
Unspecified	do.	1,617 [4]	3,000	6,100	4,400	4,490 [4]
Total	do.	16,677 [4]	29,900	41,500	34,000	44,000

[r]Revised. do. Ditto. -- Zero.

[1]Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Table includes data available through January 23, 2015.

[3]In addition to the commodities listed, amethyst, aquamarine, bitumen, secondary copper, diamond, emerald, garnet, ilmenite, refined or remelted lead, lime, manganese, monazite, phosphate rock, rolled-steel products, ruby, rutile, salt, sapphire, soda ash, talc, tourmaline, tungsten, and zircon are produced, but available information is inadequate to make reliable estimates of output.

[4]Reported figure.

[5]Considerably more barite is produced but it is considered to be commercially unusable.

[6]Total natural gas production less flared gas, gas used for fuel, gas used for gas lift, and reinjected gas.

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TABLE 2
NIGERIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	Aluminum Smelter Co. of Nigeria, Ltd. (ALSCON) (United Company RUSAL Plc, 85%)	Smelter at Ikot Abasi	96 [1]
Cement	Ashakacem Plc (Lafarge S.A., 58.61%)	Ashaka	900
Do.	Benue Cement Company Plc (Dangote Industries Ltd.)	Gboko	2,800
Do.	Cement Co. of Northern Nigeria Plc (BUA International Ltd., 50.7%)	Sokoto	500
Do.	Dangote Cement Works Ltd. (Dangote Industries Ltd.)	Ibese	6
Do.	Edo Cement Co. Ltd. (BUA International Ltd., 87%)	Okpella	350
Do.	Lafarge Cement WAPCO Nigeria Ltd. (Lafarge S.A., 59.95%)	Ewekoro	1,320
Do.	do.	Ewekoro II	2,500
Do.	do.	Shagamu	600
Do.	Obajana Cement Plc (Dangote Industries Ltd.)	Obajana	10,250
Do.	United Cement Company of Nigeria Ltd. (Unicem) (Nigeria Cement Holdings BV and Flour Mills of Nigeria Ltd.)	Mfamosing	2,500
Coal	Kogi State government	Ogboyoga Mine	NA
Do.	Zuma 828 Coal Ltd. (ETA-ZUMA Group)	Zuma Mine, near Ankpa	NA
Copper, secondary	Sun & Sand Industries Ltd.	Otta	NA
Iron and steel:			
Iron ore	National Iron Ore Mining Co. Ltd. (Government, 100%)	Itakpe	NA
Steel:			
Crude	African Steel Mills Ltd. (Liberty Group)	Electric arc furnace at Ikorodu	170
Do.	Ajaokuta Steel Co. Ltd. (Government, 100%)	Blast furnace at Ajaokuta	1,350 [1]
Do.	Continental Iron and Steel Co.	Electric arc furnace at Ikeja	60
Do.	Delta Steel Co. Ltd. (Asset Management Company of Nigeria)	Electric arc furnaces at Aladja	1 [2]
Do.	Federated Steel Mills Ltd.	Electric arc furnace at Ikeja	140
Do.	Nigerian Spanish Engineering Co.	Electric arc furnace at Kano	100
Do.	Sankyo Steel Mill Company Ltd.	Electric arc furnace at Ikeja	80
Do.	Universal Steel Co.	do.	50
Rolling mills	African Steel Mills Ltd. (Liberty Group)	Ikorodu	100
Do.	Ajaokuta Steel Co. Ltd. (Government, 100%)	Ajaokuta	130 [2]
Do.	Delta Steel Co. Ltd.	Aladja	300 [2]
Do.	Jos Steel Rolling Co. Ltd. (Zuma Steel West Africa Ltd.)	Jos region	210 [2]
Do.	Katsina Steel Rolling Co. Ltd. (Dana Steel Ltd.)	Katsina	207
Do.	Oshogbo Steel Rolling Co. Ltd. (Kura Holdings Ltd.)	Oshogbo	210
Do.	Sunflag Steel (Nigeria) Ltd.	Lagos	120
Natural gas, liquefied million metric tons	Nigeria Liquefied Natural Gas Ltd. [Nigerian National Petroleum Corp. (NNPC), 49%; Shell Gas B.V., 25.6%; Total LNG Nigeria Ltd., 15%; ENI International (N.A.) S.a.r.l., 10.4%]	Trains 1 through 6 at Finima, Bonny Island	21
Niobium (columbium) and tantalum	Artisanal miners	Jos region	NA
Nitrogen, urea	Notore Chemical Industries Ltd.	Onne	500
Petroleum:			
Crude	Nigerian National Petroleum Corp. (NNPC)/Chevron Nigeria Ltd. joint venture (NNPC, 60%, and Chevron Nigeria Ltd., 40%)	Various locations	NA
Do.	Nigerian National Petroleum Corp. (NNPC)/Elf Petroleum Nigeria Ltd. joint venture (NNPC, 60%, and Elf Petroleum Nigeria Ltd., 40%)	do.	NA
Do.	Nigerian National Petroleum Corp. (NNPC)/Mobil Producing Nigeria Unlimited joint venture (NNPC, 60%, and Mobil Producing Nigeria Unlimited, 40%)	do.	NA
Do.	Nigerian National Petroleum Corp. (NNPC)/Nigerian Agip Oil Company Ltd. (NAOC) joint venture (NNPC, 60%; NAOC, 20%; Phillips Oil Company Nigeria Ltd., 20%)	do.	NA
Do.	Nigerian National Petroleum Corp. (NNPC)/Pan Ocean Oil Corp. joint venture (NNPC, 60%, and Pan Ocean Oil Corp., 40%)	Oil Mining Lease 98	NA

See footnotes at end of table.

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TABLE 2—Continued
NIGERIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum—Continued:				
Crude—Continued		Nigerian National Petroleum Corp. (NNPC)/Shell Petroleum Development Company of Nigeria (SPDC) joint venture [NNPC, 55%; SPDC, 30%; Total E&P Nigeria Ltd., 10%; Nigerian Agip Oil Company Ltd. (NAOC), 5%]	Various locations	NA
Do.		Nigerian National Petroleum Corp. (NNPC)/Texaco Overseas Petroleum Company of Nigeria Ltd. joint venture (NNPC, 60%; Texaco Oversesas Petroleum Company of Nigeria Ltd., 20%; Chevron Nigeria Ltd., 20%)	do.	NA
Do.	million 42-gallon barrels	Star Deep Water Petroleum Ltd. [Chevron Nigeria Ltd., 68.2%, and Nigerian National Petroleum Corp. (NNPC), 15.9%]	Agbami Project	91
Do.		Other Nigerian National Petroleum Corp. (NNPC) joint ventures	do.	NA
Do.	million 42-gallon barrels	Esso Exploration and Production Nigeria Ltd., 56%, and Shell Nigeria Exploration and Production Co., 44%	Erha Project	55
Do.	do.	Shell Nigeria Exploration and Production Co., 55%, and Esso Exploration & Production Nigeria (Deepwater) Ltd., 20%	Bonga Project	73
Do.		Domestic and foreign oil companies engaged in numerous production-sharing contracts, service contracts, or sole risk operations	Niger River Delta and offshore	NA
Refined petroleum products	thousand 42-gallon barrels	Port Harcourt Refining Co. Ltd. (Government, 100%)	New Port Harcourt refinery	55,000
Do.	do.	do.	Old Port Harcourt refinery	22,000
Do.	do.	Warri Refinery and Petrochemicals Co. Ltd. (Government, 100%)	Warri refinery	43,000
Do.	do.	Kaduna Refinery and Petrochemicals Co. Ltd. (Government, 100%)	Kaduna refinery	38,000
Do.	do.	Niger Delta Petroleum Resources Ltd. (Niger Delta Exploration & Production PLC)	Topping plant at the Ogbele oilfield, about 45 kilometers northwest of Port Harcourt	100
Tin		Artisanal miners	Mines in the Jos area	NA

Do., do. Ditto. NA Not available.
[1]Under rehabilitation.
[2]Care-and-maintenance status.

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The Mineral Industry of Rwanda

By Thomas R. Yager

In 2013, Rwanda was the world's leading producer of tantalum, accounting for 51% of global output. Rwanda also accounted for nearly 1% each of world tin and tungsten production. Domestic consumption of minerals was not globally significant. In 2013, the manufacturing sector accounted for 4.8% of Rwanda's gross domestic product, and the mineral sector, 1.9% (African Development Bank Group, 2014; Shedd, 2015; Tolcin, 2015; Papp, 2015).

In July 2010, the U.S. Congress passed the Dodd-Frank Wall Street Reform and Consumer Protection Act, which contains provisions concerning the use of minerals to finance military conflict in the eastern part of the Democratic Republic of the Congo [Congo (Kinshasa)]. The U.S. Securities and Exchange Commission (SEC) issued regulations in final form in accordance with the Dodd-Frank Wall Street Reform and Consumer Protection Act in August 2012 (U.S. Securities and Exchange Commission, 2012, p. 56274–56275).

Under the new regulations, all companies registered with the SEC that sell products containing cassiterite, columbite-tantalite, gold, or wolframite are required to disclose whether these minerals originated from Congo (Kinshasa) or adjoining countries. Companies that sell products containing cassiterite, columbite-tantalite, gold, or wolframite that originated in Congo (Kinshasa) or adjoining countries are also required to submit annual reports to the SEC that describe the due diligence measures taken, the smelters that processed the minerals, and the companies' efforts to determine the mine of origin. The reports also are required to describe products that contain conflict minerals, and the reports are to be published on the companies' Web sites (U.S. Securities and Exchange Commission, 2012, p. 56274).

In December 2010, the Government of Rwanda and the International Tin Research Institute (ITRI) started the ITRI Tin Supply Chain Initiative (iTSCI) certification scheme for domestically produced tantalum, tin, and tungsten to meet the end user requirements of the Dodd-Frank Wall Street Reform and Consumer Protection Act. By the end of 2013, 224 mining companies that operated 638 mine sites were participating in the iTSCI. Starting in July 2013, ITRI started a mineral sampling program at numerous mine sites; 324 out of the planned 480 samples were collected by yearend (International Tin Research Institute, 2014b).

Production

In 2013, production for tantalum increased by an estimated 94% compared with that of 2012; niobium, by an estimated 89%; natural gas, by an estimated 50%; and tungsten, by an estimated 33%. The country's only cement plant continued to operate at full capacity in 2013 (table 1; National Institute of Statistics of Rwanda, 2014, p. 83).

Structure of the Mineral Industry

Privately owned companies, cooperatives, and artisanal miners produced cassiterite, columbite-tantalite, crushed stone, gemstones, gold, peat, and wolframite. Kibuye Power 1 Ltd. (KP1), which produced natural gas, was a state-owned company. In March 2013, the Government announced plans to sell its shares in Bayview Mining Co., Gatumba Mining Concessions Ltd. (GMC), and Rutongo Mines Ltd.

Cassiterite, columbite-tantalite, and wolframite were produced by at least 224 mining companies that operated at least 638 mine sites. About 200 of the mine sites operated by companies participating in iTSCI were inactive or suspended from mining for various reasons. In 2013, a total of 53 new mining companies started operations in Rwanda (International Tin Research Institute, 2014b).

Commodity Review

Metals

Niobium (Columbium), Tantalum, and Tin.—Columbite-tantalite was mined by numerous companies and artisanal mining cooperatives. In 2013, reported columbite-tantalite exports increased to 2,466 metric tons (t) from 1,145 t in 2012. Increased exports were attributable to new mining companies starting operations. Production in Western Province's Rutsiro District was 140 t in 2013; Nyabihu District, 122 t; Rubavu District, 104 t; and Ngororero District, 59 t; and in Southern Province's Ruhango District, 56 t. In 2012, production in Rubavu District was 99 t; Rutsiro District, 78 t; Nyabihu District, 47 t; Ngororero District, 46 t; and Ruhango District, 6 t (International Tin Research Institute, 2014a, b; National Institute of Statistics of Rwanda, 2014, p. 83).

Rutongo Mines Ltd. (a subsidiary of Tinco Investments Ltd. of the United Kingdom) was Rwanda's leading cassiterite producer; cassiterite was mined by numerous companies and artisanal mining cooperatives. In 2013, reported cassiterite exports increased to 4,895 t from 4,637 t in 2012. Production in Rulindo District (Northern Province) was 944 t in 2013; Kayonza District (Southern Province), 280 t; Gatsibo District (Eastern Province), 239 t; Muhanga District (Southern Province), 229 t; and Rutsiro District, 212 t. Production in Rulindo District was 1,126 t in 2012; Kayonza District, 228 t; Rutsiro District, 219 t; Gatsibo District, 188 t; and Muhanga District, 120 t (International Tin Research Institute, 2014a; National Institute of Statistics of Rwanda, 2014, p. 83).

Substantial amounts of mixed cassiterite and columbite-tantalite were produced in Rwanda. The Rutsiro District produced 705 t in 2013; Muhanga District, 517 t; Rubavu District, 469 t; Gakenke District (Northern Province), 427 t; and Ngororero District, 352 t. The Muhanga District produced 286 t in 2012; Ngororero District, 268 t; Rutsiro District, 196 t;

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Gakenke District, 71 t; and Rubavu District, 66 t. Mixed cassiterite and columbite-tantalite was separated into cassiterite and columbite-tantalite before export (International Tin Research Institute, 2014a).

Tungsten.—Eurotrade International S.A. (a subsidiary of Tinco Investments) was Rwanda's leading wolframite producer; wolframite was mined by numerous companies and artisanal mining cooperatives. In 2013, reported wolframite exports increased to 2,218 t from 1,751 t in 2012; increased exports were attributable to new mining companies starting operations. Production in Ngororero District was 322 t in 2013; Rulindo District, 298 t; Burera District, 296 t; Rutsiro District, 227 t; and Muhanga District, 166 t. Production in Rulindo District was 298 t in 2012; Ngororero District, 283 t; Burera District, 278 t; Muhanga District, 196 t; and Rutsiro District, 186 t (International Tin Research Institute, 2014a, b; National Institute of Statistics of Rwanda, 2014, p. 83).

In late 2013, Rwanda Allied Partners Ltd. (RAP) (a subsidiary of RAP Holding) was producing wolframite at the rate of 240 metric tons per year (t/yr). The company planned to increase its output to 480 t/yr by yearend and to 1,200 t/yr by May 2014. By 2017, Rwanda Allied Metals (a subsidiary of RAP Holding) was expected to open a new plant that would process wolframite to sodium tungstate (Salem, 2013).

Industrial Minerals

Cement.—Rwanda's cement demand amounted to about 350,000 t/yr, of which about 100,000 t/yr was supplied by Cimenterie du Rwanda Ltd. (Cimerwa). Cement was imported from Kenya, Tanzania, Uganda, and other countries. In December 2012, PPC Ltd. of South Africa purchased a 51% share in Cimerwa. PPC planned to expand Cimerwa's capacity to 700,000 t/yr by 2015 (Global Cement Magazine, 2013; International Cement Review, 2014).

Gemstones.—By the end of 2013, Sapphire Miners Cyangugu Ltd. (SMC) of Thailand was expected to start mining in Rusizi District (Western Province). SMC planned to produce between 1 and 3 kilograms per day of sapphire. At yearend, the company had not started mining operations (Ministry of Natural Resources of Rwanda, 2013).

Mineral Fuels and Related Materials

Natural Gas.—KP1 extracted natural gas from Lake Kivu for use in its 4.5-megawatt (MW)-capacity gas-fired power station. The company was expected to increase its electricity-generating capacity by 20 MW in 2014 and in annual increments of 10 MW between 2015 and 2017. Kivuwatt Ltd. (a subsidiary of ContourGlobal LLC of the United States) planned to extract natural gas from Lake Kivu and to start a new gas-fired power station by 2013. The station's initial capacity was likely to be 25 MW, with increases to 100 MW by 2015 and 200 MW by 2017. The startup date was subsequently revised to 2014 (Stopforth, 2013; Ngoboka, 2014).

Peat.—Peat Energy Co. (a subsidiary of Rwanda Investment Group S.A.) produced about 24,000 t/yr of peat for use in cement production. Rwanda Auto Services supplied peat to prisons for cooking fuel. The Government planned to complete a total of six new peat-fired power stations with a total capacity of 260 MW by 2017. The first 15-MW power station was expected to be completed in 2014, and two additional 15-MW power stations were scheduled to be completed in 2016 (Stopforth, 2013).

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TABLE I
RWANDA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
Cement		92,100	95,101	94,100	100,000 e	100,000 e
Gold, mine output, Au content[3]	kilograms	30	3	-- r	-- r	--
Niobium (columbium) and tantalum:[3]						
Columbite-tantalite concentrate:						
Gross weight	kilograms	952,000	560,000	890,076 r	1,144,684 r	2,466,025
Nb content e	do.	120,000 r	70,000 r	110,000 r	140,000 r	310,000
Ta content e	do.	200,000 r	120,000 r	190,000 r	240,000 r	530,000
Cassiterite concentrate:						
Gross weight		4,205	5,293	6,952 r	4,637 r	4,895
Nb content e	kilograms	40,000	50,000	70,000	50,000	50,000
Ta content e	do.	60,000	80,000	100,000	70,000	70,000
Natural gas, dry e	million cubic meters	1	3	2 r	2 r	3
Peat e		19,000	29,000	46,000	46,000	46,000
Stone:[e, 4]						
Limestone		88,000	91,000	90,000	96,000	96,000
Pozzolanic materials		28,000	29,000	28,000	30,000	30,000
Sandstone		11,000	11,000	11,000	12,000	12,000
Tin, mine output, cassiterite concentrate:[3]						
Gross weight		4,205	5,293	6,952 r	4,637 r	4,895
Sn content e		2,600 r	3,300 r	4,400 r	2,900 r	3,100
Tungsten, mine output, concentrate:[3]						
Gross weight		870	764	1,006 r	1,751 r	2,218
W content e		410 r	360 r	480 r	830 r	1,100

eEstimated; estimated data are rounded to no more than three significant digits. rRevised. do. Ditto. -- Zero.

[1]Table includes data available through February 27, 2015.

[2]In addition to the commodities listed, brick clay, gemstones (such as sapphire and tourmaline), lime, and steel are also known to be produced, but information is inadequate to make reliable estimates of output.

[3]Reported exports.

[4]For use in cement production only.

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TABLE 2
RWANDA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Cimenterie du Rwanda Ltd. (Cimerwa) (PPC Ltd., 51%)	Plant at Cyangugu	100,000
Natural gas million cubic meters	Kibuye Power 1 Ltd.	Plant at Lake Kivu	11 e
Niobium (columbium) and tantalum, columbite-tantalite ore and concentrate[1]	Various companies and cooperatives	Mines in Rutsiro District	500 e
Do.	do.	Mines in Rubavu District	340 e
Do.	do.	Mines in Muhanga District	280 e
Do.	do.	Mines in Ngororeno District	240 e
Do.	do.	Mines in Gakene District	230 e
Do.	do.	Mines in Nyabihu District	140 e
Do.	do.	Mines in Bugesera District	130 e
Do.	do.	Mines in Gatsibo District	120 e
Do.	do.	Mines in Nyamasheke District	120 e
Do.	do.	Mines in Rubavu District	110 e
Do.	do.	Mines in Ruhango District	75 e
Peat	Peat Energy Co. [subsidiary of Rwanda Investment Group S.A. (RIG)]	Mine at Gishoma in Rusizi District	26,000
Do.	Rwanda Auto Services	Mines in Northern and Eastern Provinces	22,000 e
Sapphire kilograms	Sapphire Miners Cyangugu Ltd. (SMC)	Mines in Rusizi District[2]	1,100 e
Stone, crushed:			
Limestone	Cimenterie du Rwanda Ltd. (Cimerwa) (PPC Ltd., 51%)	Mine at Nyakabuye	110,000 e
Pozzolanic materials	do.	do.	34,000 e
Sandstone	do.	Mine at Nengo	13,000 e
Tin:			
Cassiterite, ore and concentrate[1]	Rutongo Mines Ltd. (subsidiary of Tinco Investments Ltd.)	Gasambya, Gisanze, Karambo, Mahaza, Masoro, and Nyamyumba Mines in Rulindo District	1,200
Do.	Various companies and cooperatives	Mines in Rutsiro District	570 e
Do.	do.	Mines in Muhanga District	500 e
Do.	do.	Mines in Gakene District	400 e
Do.	do.	Mines in Gatsibo District	350 e
Do.	do.	Mines in Rubavu District	330 e
Do.	do.	Mines in Kayonza District	310 e
Do.	do.	Mines in Nyamasheke District	280 e
Do.	do.	Mines in Bugesera District	230 e
Do.	do.	Mines in Ngororeno District	210 e
Refined	Metal Processing Association	Smelter at Gisenyi[2]	200
Tungsten, wolframite ore and concentrate[1]	Eurotrade International S.A. (subsidiary of Tinco Investments Ltd.)	Nyakabingo Mine in Rulindo District	480
Do.	Various companies and cooperatives	Mines in Ngororeno District	330 e
Do.	do.	Mines in Burera District	300 e
Do.	Rwanda Allied Partners (RAP)	Kilimbari Mine in Kayonza District	270 e
Do.	Various companies and cooperatives	Mines in Rutsiro District	230 e
Do.	do.	Mines in Muhanga District	170 e
Do.	do.	Mines in Rwamagama District	170 e
Do.	do.	Mines in Musanze District	110 e
Do.	do.	Mines in Gasabo District	90 e
Do.	do.	Mines in Kirehe District	90 e

eEstimated. Do., do. Ditto.
[1]Gross weight of concentrate.
[2]Not operating in 2013.

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The Mineral Industry of Senegal

By Omayra Bermúdez-Lugo

Senegal was among the world's leading producers of phosphate rock. Other commodities produced in the country included attapulgite, basalt, cement, gold, gravel, laterite, lead (refined), lime, limestone, natural gas, petroleum (crude), petroleum refinery products, salt, and sand. In addition to these mineral commodities, Senegal could begin producing mineral sands in 2014, when the Grande Côte Mineral Sands project (GCMS) comes online. The GCMS Mine, which was being developed by Mineral Deposits Ltd. (MDL) of Australia and ERAMET S.A. of France, through their joint-venture company TiZir Ltd., was expected to be commissioned in March 2014 and to employ 660 people. Once in operation, the mine would produce an average of about 85,000 metric tons per year (t/yr) of zircon, 575,000 t/yr of ilmenite, and small amounts of rutile and leucoxene. The ilmenite produced by GCMS was to be transported by rail to the Port of Dakar and then shipped to the Tyssedal smelter in Norway for the production of titanium slag. Titanium slag was to be sold as a feedstock for the production of titanium dioxide pigments. The high-purity pig iron coproduct recovered from the smelting process was to be sold to foundry operators (ERAMET Group, 2014, p. 5, 14, 19; Mineral Deposits Ltd., 2014, p. 12, 14).

Senegal also had the potential to become an iron ore producer when the Faleme iron ore project comes online. The project remained on hold in 2013 owing to an unresolved dispute between the Government and Luxembourg-based ArcelorMittal Holdings AG, which held the mining rights to the project. In September, an arbitral tribunal within the Court of Arbitration of the International Chamber of Commerce in Paris ruled in favor of the Government of Senegal, which claimed that ArcelorMittal had breached its contract regarding the development of the Faleme project. A new arbitration phase to determine the potential liability of ArcelorMittal was scheduled for late 2015; ArcelorMittal reported that it would continue to defend its position. In 2011, the parties had engaged in a conciliation procedure in an attempt to reach mutually acceptable terms to solve the dispute, but were unable to reach an agreement, which led to the Government's claim before the Court of Arbitration in 2012 (ArcelorMittal, 2014, p. 32, 143).

Table 1 provides data on the principal mineral commodities produced in Senegal from 2009 to 2013, and table 2 provides a list of major mineral industry facilities in 2013. More-extensive coverage of the mineral sector of Senegal can be found in the 2011 and 2012 U.S. Geological Survey Minerals Yearbook, volume III, Area Reports—International—Africa and the Middle East, which are available at http://minerals.usgs.gov/minerals/pubs/country/.

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TABLE 1
SENEGAL: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Thousand metric tons unless otherwise specified)

Commodity[3]		2009	2010	2011	2012	2013
Basalt[4]		1,321	1,167	1,415	2,328	2,300 e
Cement, hydraulic		3,320	4,066	4,677	4,689	5,191
Clay, fuller's earth (attapulgite)		181	204	181	181 e	235
Gold, mine output, Au content	kilograms	5,055	4,381	4,089	6,666	6,445
Laterite[4]		103	226	1,035	2,386	2,400 e
Lead, secondary	metric tons	NA	NA	NA	NA	2,607
Lime		46	24	26	36	40 e
Limestone[4]		1,415	1,248	1,093	2,407	2,400 e
Natural gas[e]	thousand cubic meters	17,500	24,000	36,000	-- r	--
Petroleum:[5]						
Crude	thousand 42-gallon barrels	249	398	403	57	117
Refinery products		739	617	738	818	751
Phosphate rock and related products:						
Phosphate rock		949	1,079	1,411	1,381	882
Phosphoric acid, P_2O_5 content		283	312	362	363	259
Calcium phosphate-based fertilizers		44	45	37	36	26
Salt		222	232	258	237	243
Sand[4]		2,065	2,040	1,706	1,468	1,500 e

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. NA Not available. --Zero.

[1]Table includes data available through January 5, 2015.

[2]In addition to the commodities listed, Senegal also produced sand and gravel and stone for local construction purposes, but information was inadequate to make reliable estimates of output.

[3]Major source of information: Agence National de la Statistique et de la Démographie.

[4]Values converted from cubic meters to metric tons. Specific gravity, in grams per cubic centimeter—basalt, 2.8; laterite, 2.55; limestone, 2.6; and sand, 2.6.

[5]Crude petroleum values have been converted from metric tons to 42-gallon barrels using a conversion factor of 7.4 barrels of crude petroleum per metric ton.

TABLE 2
SENEGAL: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of mine facilities	Annual capacity
Attapulgite		Senegal Mines SA (Sepiol SA, 51%, and Government, 49%)	240 kilometers south of Dakar	100.
Do.		Société Senegalaise de Phosphates de Thies S.A.	Lam Lam, Thies region	NA.
Cement		Les Ciments du Sahel S.A.	Kirene plant	2,400.
Do.		Sococim Industries (Vicat Group, 99.91%)	Rufisque cement plant, east of Dakar	3,500.
Gold	kilograms	Sabodala Gold Operations S.A. (Teranga Gold Corp., 90%, and Government, 10%)	650 kilometers east of Dakar	6,500.
Lead	metric tons	Gravita Senegal SAU (Gravita India Ltd., 100%)	Recycling lead acid battery plant, Dakar	2,650.
Petroleum products		Petrosen, 45%; Binladin Group, 34%; Total S.A., 20%	Refinery, 23 kilometers from Dakar	1,226.
Phosphate rock, aluminum		Société Senegalaise de Phosphates de Thies SA	Lam Lam, Sebikhotane, and Allou-Kagne	NA.
Phosphate rock, calcium		Industries Chimiques du Sénégal Group (Government of India and Indian Farmers Fertilizer Cooperative Ltd., 85%, and Government of Senegal, 15%)	Taiba Mine, 100 kilometers from Dakar	2,000.
Phosphoric acid		Industries Chimiques du Sénégal Group (Indian Farmers Fertilizer Cooperative Ltd., 85%, and Government, 15%)	Darou I plant and Darou II plant, 100 kilometers from Dakar	660 P_2O_5.

Do. Ditto. NA Not available.

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The Mineral Industry of Sierra Leone

By Omayra Bermúdez-Lugo

Sierra Leone's real gross domestic product (GDP) grew by an estimated 20.1% in 2013. Economic growth was mostly driven by an increase in iron ore production resulting from the ramping up of mining operations at the Marampa and the Tonkolili Mines and the reported improved performance of the agriculture, construction, and services sectors. Nominal GDP was estimated to be $4.9 billion. Although agriculture remained the mainstay of the economy, accounting for about 43% of the GDP and employing about 70% of the country's total workforce, the mineral sector was the country's principal income earner, accounting for 93.4% of export revenues in 2013. Sierra Leone was ranked among the world's top 10 producers of diamond and rutile by carat and tonnage, respectively. Other commodities produced included bauxite, cement, gold, and ilmenite and zirconium mineral concentrates. In 2013, Sierra Leone was open to foreign direct investment and adhered to global standards for transparency, which included participation in the Extractive Industries Transparency Initiative (EITI) and the Kimberley Process Certification Scheme (Bank of Sierra Leone, 2014, p. 1–3, 23; International Monetary Fund, 2014a, p. 4–5, 28; 2014b).

Economic growth continued despite frequent interruptions in electricity supply throughout the year. The Bank of Sierra Leone reported that electricity generation decreased by 7.98% to 164.13 gigawatthours (GWh) in 2013 from 178.38 GWh in 2012, which continued to limit industrial output. On June 20, 2013, however, the Government obtained a $16 million grant from the World Bank to upgrade the electricity capacity and supply in the capital city of Freetown and for the development of rural electrification projects (Bank of Sierra Leone, 2014, p. 1, 7).

Government Policies and Programs

The Ministry of Mines and Mineral Resources of Sierra Leone (MMR) is the Government agency responsible for the administration of the mining sector, which is regulated by the Mines and Minerals Act of 2009. Under this law, all rights of ownership and control of minerals in Sierra Leone are vested in the State. Petroleum exploration and production are regulated by the Petroleum (Exploration and Production) Act (2011). The Petroleum Directorate is the Government agency tasked with monitoring all petroleum operations in the country, including assisting in the assessment of prospective investors in the sector, participating in the bidding process, assessing royalties and bonuses due to the Government, and ensuring the establishment of a central database for petroleum-related activities, among other tasks. The Sierra Leone National Petroleum Company is responsible for the management, on behalf of the Government, of all commercial aspects of petroleum operations in the country (Ministry of Mines and Mineral Resources of Sierra Leone, 2010; Sierra Leone Web, 2013).

The National Minerals Agency (NMA), which was created through the enactment of the National Minerals Agency Act in 2012, was officially launched on March 7, 2013. NMA is tasked with implementing mining policies and mineral legislation as devised by the MMR, and is responsible for the enforcement of the Mines and Minerals Act of 2009, for the management of mineral rights, for the collection and dissemination of geologic information, and for the regulation of trade in precious minerals (National Minerals Agency, 2014).

Production

Output levels for gold, bauxite, cement decreased during the year by 27.4%, 20.6%, and 6.6%, respectively. Production increased, however, for all other mineral commodities, including iron ore, zirconium concentrate, ilmenite concentrate, rutile concentrate, and diamond, which increased by 208%, 184%, 43.2%, 27.4%, and 12.5%, respectively. The increase in diamond production was largely driven by improved performance from the Koidu Mine, and that of ilmenite, rutile, and zirconium was owing to the commissioning of a new dry mining facility. The significant increase in iron ore output was mainly the result of the ramping up of production at the Marampa and the Tonkolili iron ore mines. Data on mineral production are in table 1.

Structure of the Mineral Industry

Sierra Leone's mining and mineral processing operations were privately owned. Table 2 is a list of major mineral industry facilities.

Mineral Trade

Export revenues, as reported by the Bank of Sierra Leone, totaled $1.92 billion in 2013, which was an increase of 70.9% compared with the total export revenues in 2012. The mineral sector accounted for the majority of these revenues, most of which came from increased earnings from the iron ore industry (56%). Iron ore exports increased by 161% to 13.6 million metric tons (Mt) valued at $1.06 billion. Diamond exports, which were mainly gem-quality diamond, increased by 13.6% to about 605,000 carats, and were valued at $186 million; industrial-quality diamond exports increased by about 16% in terms of weight, but decreased by about 5.2% in terms of value. Exports of rutile and ilmenite increased by 76.2% to 149,535 metric tons (t) and 21.6% to 12,169 t, respectively; rutile exports were valued at $129.6 million, and ilmenite exports, at $2.92 million. Bauxite and gold exports decreased by 37.4% to 447,849 t and by 31.6% to 96 kilograms, respectively; bauxite exports were valued at $13.82 million, and gold exports, at $3.68 million. The Bank of Sierra Leone also reported revenues from the export of other minerals such as molybdenum, silver, and tin, but it was not clear if these were revenues generated from reexports, as Sierra Leone did

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not report production of these three minerals in 2013 (Bank of Sierra Leone, 2014, p. 23–24).

In 2013, Sierra Leone was the United States 155th-ranked export market for goods and its 144th-ranked supplier of import goods. Total exports to the United States were valued at about $41.6 million compared with about $17.8 million in 2012; $27.1 million of these exports were steelmaking materials, $6.9 million were rough diamond, and $1.1 million were sulfur. Imports from the United States were valued at about $82.4 million compared with a revised $100.8 million in 2012; these included $12.9 million in excavating machinery, $287,000 in petroleum products; $71,000 in iron and steel products, and $26,000 in iron and steel mill products. Sierra Leone was an active member of the Economic Community of West African States (U.S. Census Bureau, 2014a, b).

Commodity Review

Metals

Bauxite and Alumina.—The Sierra Minerals Mine produced a total of 616,000 t of bauxite during the year compared with 776,000 t in 2012. The mine was operated by Netherlands-based Vimetco N.V. through its subsidiary Sierra Mineral Holdings I Ltd. Vimetco attributed the decrease in production to the "difficult climate in Sierra Leone" and to "social and cultural differences"; however, the company did not qualify these difficulties or differences in its annual report. All bauxite produced at the mine was shipped to Romania for refining into alumina at Vimetco's alumina refinery in Tulcea and into aluminum at the company's aluminum smelter in Slatina. During the year, the company completed the refurbishing of the mine's bauxite washing equipment, which doubled the washing capacity to 4,000 metric tons per day (t/d) from 2,000 t/d and the productivity to 100,000 metric tons per month (t/mo) from an average of 50,000 t/mo (Vimetco N V., 2014, p. 10, 15).

Gold.—London-based Amara Mining plc completed a definitive feasibility study for its Baomahun gold project during the second quarter of 2013. The project is located about 180 kilometers (km) east of Freetown in Southern Province. The study yielded indicated resources of 38.4 Mt at an average grade of 1.81 grams per metric ton (g/t) gold and inferred resources of 6.6 Mt at an average grade of 2.53 g/t gold. Once in operation, the Baomahun Mine was expected to produce about 4,600 kilograms per year of gold during the first 6 years of production. As of yearend 2013, Amara Mining planned to conduct a small-scale, near-surface drilling campaign to further evaluate the possibility of developing Baomahun's underground resources (Amara Mining plc, 2014, p. 6–7).

Iron Ore.—African Minerals Ltd. (AML) of the United Kingdom continued to ramp up production at its Tonkolili iron ore mine towards its phase I target of 20 million metric tons per year (Mt/yr). In 2013, Tonkolili Mine produced a total of 16.9 Mt of crude ore at an average grade of 57.6% Fe compared with a revised 5.3 Mt at a grade of 58% Fe in 2012. Despite the marked increase in production, AML reported having had some operational problems during the year. The operational problems mostly affected shipping activities and included the breakdown of the mine's principal conveyor belt and insufficient transshipment vessels. AML used transshipment vessels to transfer iron ore from the Port of Pepel onto bulk carriers located at the offshore terminal; the ore was then exported to China. As of yearend, the company increased its transshipment fleet to four from three contracted vessels in order to avoid future shipment delays. A total of 12.1 Mt of direct-shipping ore was exported during the year. AML planned to continue with the optimization of the Tonkolili Mine and to reach phase II of its expansion plans, which targets the further ramping up of production to 25 Mt/yr by 2016. About 80% of AML's employees were Sierra Leonean nationals. The company held a 25-year mining license for the Tonkolili Mine with the right to renew the license for an additional period of 15 years effective from the date of expiration of the original license (African Minerals Ltd., 2014, p. 5, 18–19, 22).

Mining operations also continued to ramp up at the Marampa Mine, which was operated by London Mining plc of the United Kingdom. The mine produced a total of 3.42 Mt of iron ore sinter concentrates at an average grade of 63.6% Fe compared with 1.5 Mt at a grade of 32% Fe in 2012. Production, which was from the mining of highly weathered primary ore and from tailings, fell short of the company's forecast for 2013 of 3.9 Mt/yr. This was owing to delays in the completion of processing plant upgrades and an unexpected prolonged rainy season. During the year, a second processing plant was commissioned at the Marampa Mine, which increased the production capacity to 5.4 Mt/yr. London Mining contracted two transshipment vessels to draw down iron ore stockpiles and completed a feasibility study to expand the production capacity further to 6.5 Mt/yr by 2015. The feasibility study yielded a life-of-mine plan of more than 40 years based on reserves of more than 500 Mt at an average grade of 31% Fe. London Mining planned to produce between 4.9 and 5.4 Mt of iron ore concentrates in 2014 at an average grade of 64% to 65% Fe. Another planned mine development project included the upgrading of the electricity-generating capacity of the mine's powerplant to 50 megawatts (MW) from 15 MW, which was expected to provide electricity for the processing of unweathered ore in the future (London Mining plc, 2014, p. 16, 24–25).

Titanium and Zirconium.—Sierra Rutile Mine, which was operated by Sierra Rutile Ltd. of the United Kingdom, was the country's sole producer of ilmenite, rutile, and zirconium concentrates. In 2013, the mine produced a total of 120,349 t of rutile concentrate, 32,349 t of ilmenite concentrate, and 3,185 t of zirconium concentrate byproduct. The company reported that its new Lanti dry mining plant was operating at nameplate capacity throughout the year and announced that it had signed a 70,000-metric-ton-per-year rutile supply agreement with a major pigment producer, whose name was not disclosed. During the year, Sierra Rutile also signed a memorandum of understanding with Smol Pawa Sierra Leone Ltd. for the purchase of electrical power from its 14-MW-capacity Moyamba hydroelectric powerplant project. The project, which was to be developed in partnership with the Government of Sierra Leone, would be located at the Singimi Falls along the Gbangba River about 20 km from the Sierra Rutile Mine. Once commissioned, the powerplant was also expected to serve the community of

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Moyamba and the Njala University. A feasibility study for the project was underway in 2013. Sierra Rutile also planned to continue with its resource expansion program in 2014 and to continue its exploration program for other targets, including the Gbangbaia, the Jagbwema, and the Semabu deposits, which were adjacent to Sierra Rutile. The Sierra Rutile Mine is located in southwestern Sierra Leone near the Imperri Hills, about 30 km from the Atlantic Ocean and 135 km from the capital city of Freetown (Sierra Rutile Ltd., 2014, p. 6, 9, 11–12).

Industrial Minerals

Diamond.—Diamond in Sierra Leone was mined mainly from secondary (alluvial) deposits at the Bo, the Kenema, and the Kono districts along the drainages of the Bafi, the Mano, the Moa, the Sewa, and the Woyie Rivers. At least one company, BSG Resources Ltd. (BSGR) of the United Kingdom mined diamond from primary (kimberlite pipes) deposits in the Tankoro chiefdom of the Kono district, which is located in Eastern Province about 360 km east of the capital city of Freetown. The project, known as the Koidu Kimberlite Project (KKP), consisted of two kimberlite pipes, four kimberlite dike zones, and four small blows (small pipe-like primary diamond deposits that form along kimberlitic dike systems), which the company mined through its subsidiary OCTÉA Diamond Group (formerly known as Koidu Holdings S.A.). BSGR planned to expand capacity at KKP to about 550,000 carats per year from its existing capacity of 120,000 carats per year. The company also held the exploration rights for an area that hosts several kimberlite dike zones known as the Tonguma diamond project. The project is located about 68 km south of Koidu in the Lower Bambara chiefdom, Kenema district. In 2013, the Kimberley Process Certification Scheme reported Sierra Leone's total rough diamond production to be 608,955 carats, which represented a 12.5% increase from production in 2012. The average value per carat remained about the same as that of 2012, or $302.95 per carat (Kimberley Process Rough Diamond Statistics, 2014; BSG Resources Ltd., [undated]).

Mineral Fuels

Petroleum.—Sierra Leone did not produce or refine petroleum and was dependent upon imports to meet its domestic petroleum requirements. Several international petroleum companies continued to explore for petroleum offshore Sierra Leone, including African Petroleum Corp. Ltd. of Australia; Anadarko Petroleum Corp. of Houston, Texas; Repsol S.A. of Spain; Lukoil Group of Russia; and Tullow Oil plc of the United Kingdom (FirstEnergy Capital LLC, 2013, p. 6, 22; U.S. Securities and Exchange Commission, 2014, p. 12; Repsol S.A., 2014, p. 68–69; Tullow Oil plc, 2014, p. 61).

Outlook

The International Monetary Fund reported that iron ore mining, agriculture, and services are expected to remain the key drivers of growth in Sierra Leone during the next several years. A projected decline in the price of iron ore could slow down economic growth, however, and, if sustained, could hinder growth in the longer term given the country's growing dependence on iron ore export revenues. A decline in the price of iron ore could also serve as a deterrent to foreign direct investment in the country's iron ore industry. It is unlikely that increased production from planned expansion projects in the bauxite and mineral sands sector could counterbalance the loss of Government revenues were iron ore projects to come to a halt as a consequence of the continued decline in global prices (International Monetary Fund, 2014a, p. 4-6).

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TABLE 1
SIERRA LEONE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
Bauxite[3]	thousand metric tons	757	1,090	1,300	776	616
Cement[4]		236,240	300,980	310,890	335,400	313,360
Diamond[5]	carats	400,843 [6]	437,516 [6]	357,161 [7]	541,166 [7]	608,955 [7]
Gold, mine output, Au content[4]	kilograms	157	270	164	135 [r]	98
Iron ore:						
Gross weight	thousand metric tons	--	--	1,300 [8]	6,600	20,300
Fe content (32% to 64%)	do.	--	--	800 [9]	3,600 [9]	11,900 [10]
Titanium:						
Ilmenite concentrate		15,161	18,206	15,946	22,590	32,349
Rutile concentrate		63,864	68,198	67,916	94,493	120,349
Zirconium concentrate		5,560	7,092	8,496	1,120 [r]	3,185

[r]Revised. do. Ditto. -- Zero.
[1]Table includes data available through December 18, 2014.
[2]In addition to the commodities listed, lignite reportedly was produced, but available information is inadequate to make a reliable estimate of output.
[3]Production in dry metric tons.
[4]Source: Bank of Sierra Leone.
[5]Source: Kimberley Process Certification Scheme.
[6]About 60% gem quality and 40% industrial quality.
[7]About 80% gem quality and 20% industrial quality.
[8]Excludes production from the Marampa Mine, which began operating in December 2011.
[9]Iron content of ore for Marampa Mine (1.5 Mt) estimated to be 32%; iron content of ore for Tonkolili Mine (5.1 Mt) estimated to be 58%.
[10]Iron content of ore for Marampa Mine (3.4 Mt) estimated to be 63.6%; iron content of ore for Tonkolili Mine (16.9 Mt) estimated to be 57.6%.

TABLE 2
SIERRA LEONE: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Bauxite		Sierra Mineral Holdings 1 Ltd. (Vimetco N.V., 100%)	Sierra Minerals Mine, 150 kilometers southeast of Freetown	1,500
Cement		Sierra Leone Cement Corp. Ltd. (HeidelbergCement AG, 100%)	Leocem cement plant, Freetown	600
Diamond	thousand carats	OCTÉA Diamond Group (BSG Resources Ltd., 100%)	Koidu kimberlite project (two kimberlite pipes, four kimberlite dike zones, and four blows) 2 kilometers from the district capital of Koidu	120
Iron ore		Tonkolili Iron Ore (SL) Ltd. (African Minerals Ltd., 75%, and Shandong Iron and Steel Group Co. Ltd., 25%)	Tonkolili Mine, 190 kilometers northeast of Freetown	20,000
Do.		London Mining plc	Marampa Mine, 150 kilometers northeast of Freetown	5,400
Titanium, ilmenite concentrate		Sierra Rutile Ltd.	Sierra Rutile Mine, 130 kilometers southeast of Freetown	33
Titanium, rutile concentrate		do.	do.	135
Zirconium concentrate		do.	do.	10

Do., do. Ditto.

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The Mineral Industry of Somalia

By Thomas R. Yager

Somalia, which is an East African country located on the Gulf of Aden and the Indian Ocean, produced small quantities of gemstones, granite, marble, niobium (columbium), salt, sand, sandstone, and tantalum in recent years. The mineral industry made only a small contribution to Somalia's exports and economy in general. The country also holds deposits of feldspar, iron ore, kaolin, limestone, natural gas, quartz, silica sand, tin, and uranium, based on previous exploration activity.

Somalia enacted a new constitution and held elections in 2012; however, the civil war continued in Somalia in 2013. Military forces of the African Union and those of the Governments of Kenya and Somalia engaged in combat with the Al-Shabab militia, especially in the southern part of the country. In mid-2013, clan-based militias also engaged in combat with each other in Kismayu in Lower Juba Province (Kron, 2013; Kulish, 2013).

In 2013, the Government declared that petroleum licenses issued by the self-declared Republic of Somaliland (which maintains a separate regional governing authority) and the self-declared semiautonomous Puntland State in northern Somalia were invalid. The governing authority of Puntland announced its support for existing petroleum production-sharing agreements within its claimed boundaries. Khatumo State in northern Somalia also claimed to be semiautonomous. Somaliland's declaration of independence in 1991 and Puntland's and Khatumo's declarations of autonomy in 1998 and 2012, respectively, were not internationally recognized (Addis Fortune, 2013; Puntland Petroleum and Minerals Agency, 2013).

Production

Mineral production data have continued to be unavailable because of the lack of a fully functioning central Government since 1991 and the armed conflict that pervaded most of the country. In 2008, niobium and tantalum mining operations in Somaliland by Green African Development AB of Sweden started; it is unclear if production continued after a labor dispute in April 2009 (Indian Ocean Newsletter, 2009).

Structure of the Mineral Industry

Berbera Marble & Granite Factory produced granite, marble, and sandstone. Gemstone-mining and salt-mining operations in Somaliland appeared to be artisanal or small scale in nature.

Commodity Review

Industrial Minerals

Cement.—In 2012, plans by Dahabshiil of the United Arab Emirates and TeleSom Co. (a local company) to restart the country's only cement plant at Berbera in Somaliland were halted by local opposition. National cement consumption was estimated to be about 250,000 metric tons in 2012 (the latest year for which data were available) (International Cement Review, 2013).

Mineral Fuels

Natural Gas and Petroleum.—Horn Petroleum Corp. of Canada and its joint-venture partners Range Resources Ltd. of Australia and Red Emperor Resources NL of Australia held the Dharoor Valley and the Nugaal Valley onshore blocks in Puntland. At the end of 2013, the companies planned to engage in a seismic surveying and drilling program through the end of 2014 or mid-2015 (Range Resources Ltd., 2014).

Genel Energy plc of the United Kingdom had a joint-venture agreement with East Africa Resource Group to explore Blocks SL–10B and SL–13 and a joint-venture agreement with Sterling Energy plc of the United Kingdom and Petrosoma to explore Blocks SL–6, SL–7, and SL–10A. In September 2013, Genel temporarily suspended operations because of problems with security. At yearend, Genel was in negotiations with the governing authority of Somaliland regarding the resumption of exploration. Other companies exploring in Somaliland included DNO International ASA of Norway and RAK Gas LLC of the United Arab Emirates (Harvey, 2013; Genel Energy plc, 2014).

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The Mineral Industry of South Africa

By Thomas R. Yager

The Republic of South Africa remained one of the world's leading mining and mineral-processing countries. In 2013, South Africa's estimated share of world mined platinum production amounted to 72%; refined rhodium, 56%; refined platinum, 55%; chromium, 48%; kyanite and related minerals, 47%; mined palladium, 37%; vermiculite, 36%; vanadium, 27%; manganese, 25%; refined palladium, 23%; refined gold, 9%; mined gold, 6%; coal, 4%; mined cobalt and fluorspar, 3% each; aluminum, iron ore, and nickel, 2% each; bentonite, refined cobalt, ferrosilicon and silicon metal combined, phosphate rock, and silica sand, 1% each. South Africa also played a globally significant role in the production of ilmenite, rutile, and zircon (BP p.l.c, 2014, p. 32; Cobalt Development Institute, 2014; CPM Group, 2014, p. 7, 109, 175; World Gold Council, 2014, p. 17; Bray, 2015; Corathers, 2015a, b; Dolley, 2015; George, 2015; Jasinski, 2015; Kuck, 2015; Loferski, 2015; McRae, 2015; Papp, 2015; Polyak, 2015; Shedd, 2015; Tanner, 2015a, b; Tuck, 2015).

In 2013, South Africa's estimated share of the world's consumption of coal was 2.3%, and that of petroleum products, 0.6%. The country also accounted for 92% of total African coal consumption and 16% of total African petroleum products consumption in 2013 (BP p.l.c., 2014, p. 9, 33).

Minerals in the National Economy

The mineral industry accounted for 8.3% of the gross domestic product (GDP) in 2013 compared with a revised 8.6% in 2012. Employment in the mineral industry amounted to 510,099 workers in 2013 compared with 524,632 in 2012 and 435,628 in 2003. In 2013, platinum-group metal (PGM) mining accounted for 37.5% of the mineral industry's employment; gold, 25.8%; coal, 17.2%; iron ore, 4.1%; chromite, 3.6%; diamond, 2.7%; manganese, 1.9%; and other minerals, 7.2%. In 2003, gold mining accounted for 45.6% of the mineral industry's employment; PGMs, 29.3%; coal, 10.8%; diamond, 4.1%; and chromite, iron ore, and manganese combined, a total of 3.3% (Chamber of Mines of South Africa, 2013, p. 12; 2015, p. 14; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., October 28, 2014).

Government Policies and Programs

The Government's Black Economic Empowerment (BEE) program requires that black ownership of mining companies reach 26% by 2014. Companies are allowed to use the value of their domestic beneficiation activities as credit for up to 11% of their black ownership requirements. Companies are required to purchase 70% of their services, 50% of their consumable goods, and 40% of their capital goods from BEE entities by 2014. Companies are also required to report progress annually on the development of near-mine communities, the sustainability of growth and development, and mineral beneficiation (Creamer, 2010).

Government-owned utility Eskom engaged in power buybacks from producers of ferrochromium, ferrosilicon, and silicon metal in 2012 and early 2013; Eskom paid the producers to shut down some of their capacity to prevent power shortages. In March 2013, the National Energy Regulator of South Africa forbade Eskom to engage in further power buybacks after June 1, 2013 (Ryan's Notes, 2013a).

In September 2012, the Government announced that its moratorium on exploration for natural gas in shale formations in the Karoo region had been lifted. As of September 2013, no exploration licenses for shale gas had been granted because the Government had not yet signed off on a legal justification for ending the moratorium (Bain, 2013).

In the Witwatersrand basin, acid mine drainage from gold mining operations threatened to contaminate water supplies in Gauteng Province with increased levels of toxic heavy metals and radioactive particles. The acid mine drainage was the result of leaching from tailings piles and from abandoned deep underground mines that filled with water that became acidic. South Africa had about 6,000 abandoned mines and 270 tailings dams in the Witwatersrand basin that contained about 6 billion metric tons of pyrite. The oxidation of pyrite led to acid mine drainage. The tailings dams also contained an estimated 430,000 metric tons (t) of uranium. In the eastern part of the Witwatersrand basin, the rising water levels in the mines are expected to reach the environmental critical level (which is the highest level in a mine in which groundwater systems are not contaminated) by November 2014 (Kolver, 2013).

In Mpumalanga Province, acid mine drainage from coal mines led to contaminated water supplies and the loss of agricultural capacity. The high sulfur content and shallowness of South Africa's coal mines contributed to problems with acid mine drainage (Kolver, 2013).

Production

In 2013, feldspar production increased by 103%; bentonite, by 47%; attapulgite, by 41%; shale, by 34%; granite and norite, by 26%; aluminum and smelted copper, by 24% each; manganese, by 23%; refined copper, by 22%; chromite, by 21%; anthracite coal and salt, by 20% each; refined cobalt, by 17%; sodium sulfate and uranium, by 14% each; diamond, by 13%; aggregate and sand and mined cobalt, by 12% each; and mined nickel, by 11%. The output of crude petroleum decreased by 59%; rutile, by an estimated 55%; zirconium, by an estimated 48%; silicon metal, by an estimated 40%; natural gas, by 29%; mica, by 23%; antimony and fluorspar, by an estimated 22% each; fire clay, by 21%; mined lead and slate, by 20%; mined zinc by 19%; titaniferous slag, by an estimated 12%; and silicomanganese, by 10% (table 1; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., October 28, 2014).

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Structure of the Mineral Industry

Most of the South African mineral industry was privately owned. The production of diamond and gold, which were produced mostly by artisanal miners in many African countries, was dominated by large-scale producers in South Africa. The leading producer's share of total output varied sharply by commodity; the leading producer of silver accounted for about 73% of national production; that of iron ore, 59%; diamond, 58%; nickel, 45%; manganese, 33%; gold, 28%; and coal, 22% (tables 1 and 2).

Mineral Trade

In 2013, South Africa's exports of iron ore amounted to $5.71 billion; platinum, $5.51 billion; gold, $5.36 billion; coal, $5.16 billion; palladium, $1.31 billion; manganese ore, $1.29 billion; chromite, $587 million; nickel, $572 million; rhodium, $505 million; diamond, $477 million; copper, $175 million; iridium, $110 million; ruthenium, $71 million; and other crude mineral products, which included ilmenite, rutile, and zircon, $1.08 billion. Exports of ferrochromium amounted to $2.55 billion; manganese alloys, $491 million; vanadium alloys and other vanadium products, $265 million; silicon metal and alloys, $131 million; and other processed mineral products, which included aluminum, antimony trioxide, phosphoric acid, and titanium slag, $2.15 billion. Crude and processed mineral products accounted for 37% of the value of total exports. About 73% of crude mineral products and 84% of processed mineral products, by value, were exported in 2013 (Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., October 28, 2014).

The percentage of domestic consumption of mineral commodities produced in South Africa varied sharply by commodity. In 2013, gold exports, by amount, were 94% of total sales; PGMs, 90%; ferrochromium, 89%; manganese alloys and vanadium, 88% each; iron ore, 86%; nickel, 82%; silicon alloys, 54%; diamond, 52%; chromite, 33%; copper, 32%; coal, 29%; granite, 24%; flint clay, 6%; and lime and silica, less than 1% each (Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., October 28, 2014).

Commodity Review

Metals

Aluminum.—South Africa produced primary aluminum from alumina imported from Guinea. BHP Billiton Ltd. of Australia operated the Bayside and the Hillside primary aluminum smelters at Richards Bay. Production at Hillside increased to 726,000 t in 2013 from 566,000 t in 2012, and production at Bayside decreased to 96,000 t from 99,000 t (BHP Billiton Ltd., 2013b, p. 4; 2014, p. 24).

Antimony.—The Consolidated Murchison Mine was South Africa's only producer of antimony. In 2012, Village Main Reef was ramping up production at Consolidated Murchison to about 3,900 metric tons per year (t/yr) of antimony. The company was engaged in deepening its three existing underground mine shafts; further increases in production were likely to result from the mining of near-surface resources. In the second half of 2013, output declined sharply because of a labor dispute in July (Clarke, 2012; Village Main Reef, 2013, 2014, p. I).

Chromium.—In 2013, chromite production was about 13.65 million metric tons (Mt) compared with 11.32 Mt in 2012 and 7.41 Mt in 2003. From 2003 to 2013, employment in chromite mining increased to 18,359 workers from 5,784 (table 1; Chamber of Mines of South Africa, 2013, p. 12, 15; 2015, p. 14).

Xstrata plc of Switzerland and its joint-venture partner Merafe Resources Ltd. operated the Helena, the Kroondal, the Magareng, the Thorncliffe, and the Waterval Mines, which had a capacity of 4.52 million metric tons per year (Mt/yr). In 2013, the Magareng Mine was commissioned and the Horizon Mine was put on care-and-maintenance status. Xstrata merged with Glencore International AG of Switzerland in May; the new company was known as Glencore Xstrata plc (Merafe Resources Ltd., 2014, p. 18).

Glencore Xstrata and Merafe operated the Boshoek, the Lion, the Lydernburg, the Rustenburg, and the Wonderkop ferrochromium plants, which had a total capacity of 1.98 Mt/yr at the beginning of 2013. The companies produced 1.56 Mt of ferrochromium in 2013 compared with 1.18 Mt in 2012. Increased production was partially attributable to improved operating results from the furnace; the commissioning of the Tswelopele pelletizing plant in 2012 led to more efficient use of chromite ore. The companies signed a power buyback agreement with Eskom that reduced output by about 130,000 t in 2013. Xstrata and Merafe completed an expansion of the Lion plant's capacity to 720,000 t/yr from 360,000 t/yr in 2013 (Glencore Xstrata plc, 2014, p. 57, 60; Markram, 2014).

Samancor Chrome Ltd. (International Mineral Resources BV of the Netherlands, 70%) produced chromite at the Eastern Chrome Mines in Mpumalanga Province and the Western Chrome Mines in North West Province. The company accounted for about 30% of South Africa's chromite production in 2012. The majority of Samancor Chrome's output was consumed in its ferrochromium plants (Competition Tribunal of South Africa, 2012).

Samancor Chrome operated the Ferrometals plant in Witbank, the Middelburg plant in Middelburg, and the Tubatse plant in Steelpoort; the plants had a combined capacity of 1.11 Mt/yr (table 2). The company accounted for about 10% of the world's ferrochromium production in 2012. In early 2013, Samancor agreed to a power buyback agreement with Eskom that reduced ferrochromium output by an estimated 63,000 t (Competition Tribunal of South Africa, 2012; Oryx Stainless Group, 2013).

Assmang (Pty) Ltd. [African Rainbow Minerals Ltd. (ARM), 50%, and Assore Ltd., 50%] operated the Dwarsrivier Mine in Mpumalanga. In 2013, chromite production increased to 1.03 Mt from 1 Mt in 2012. Chromite sales were expected to increase in 2014 (African Rainbow Minerals Ltd., 2013a, p. 75, 81; 2013b, p. 58; 2014, p. 59).

Assmang's ferrochromium production at the Machadodorp plant decreased to 23,000 t in 2013 from 73,000 t in 2012. The company converted its remaining ferrochromium furnaces at Machadodorp to ferromanganese by mid-2013 (African Rainbow Minerals Ltd., 2013a, p. 71, 78, 81; 2013b, p. 58; 2014, p. 59).

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ARM and its joint-venture partner MMC Norilsk Nickel of Russia operated the Nkomati chromite mine. Sales remained unchanged at 266,000 t; ARM planned to increase sales to 340,000 t in 2014. Chromite sales were expected to start from the Two Rivers Mine by 2014 and to reach about 250,000 t/yr by 2015 depending on the results of a feasibility study (African Rainbow Minerals Ltd., 2013a, p. 55–56, 60; 2013b, p. 64; 2014, p. 65–66).

International Ferro Metals Ltd. (IFM) of Australia operated the Lesedi and the Sky Chrome Mines and the Buffelsfontein ferrochromium plant in North West Province. In 2013, IFM produced 190,095 t of ferrochromium compared with 177,359 t in 2012. Output at the Sky Chrome Mine decreased to 182,000 t in 2013 from 585,000 t in 2012. The Lesedi Mine produced 421,000 t of chromite in 2012. Mining at Lesedi, which shut down in 2012, was likely to resume in the second quarter of 2014 and to reach full capacity in the third quarter (Tex Report, The, 2014c).

Hernic Ferrochrome (Pty) Ltd. (a subsidiary of Mitsubishi Corp. of Japan) operated the Bokone Mines, which had a capacity of 1.5 Mt/yr, and a ferrochromium plant with a capacity of 420,000 t/yr (table 2). The company signed a power buyback agreement that shut down 40% of ferrochromium capacity from the beginning of December 2012 to the end of March 2013. By early June 2013, Hernic was operating three of its four furnaces (Platinum Weekly, 2012; Davies, 2013).

ASA Metals (Pty) Ltd. (Sinosteel Corp. of China, 60%, and Limpopo Economic Development Enterprise, 40%) operated the Dilokong chromite mine near Burgersfort and a ferrochromium plant near Pietersburg with capacities of 800,000 t/yr and 400,000 t/yr, respectively. In early 2013, ASA Metals agreed to shut down three of its four ferrochromium furnaces because of a power buyback agreement with Eskom. By early June, the company had restarted one of its furnaces (Davies, 2013).

In 2012, Tharisa Minerals (Pty) Ltd. of Cyprus completed its new processing plant that increased chromite concentrate capacity at the Tharisa Mine to 1.92 Mt/yr from 420,000 t/yr. Between October 2012 and March 2013, Tharisa produced 564,000 t of chromite. The company planned to produce between 1.15 Mt and 1.3 Mt in fiscal year 2014 and to reach steady-state production of 1.85 Mt/yr in fiscal year 2016 (Projects in Progress, 2012b; Tharisa Minerals (Pty) Ltd., 2014a, b).

In mid-2013, Afarak Group Oyj of Finland (formerly Ruukki Group Oyj) was producing run-of-mine chromite at the rate of 300,000 t/yr at the Mecklenburg Mine. Afarak planned to maintain its output levels through the end of 2014; the company was considering the possibility of engaging subsequently in underground mining. Chromite from Mecklenburg was used to supply Afarak's Mogale Alloys plant, which had a combined capacity of 110,000 t/yr of ferrochromium and silicomanganese (Ryan's Notes, 2013b; Markram, 2014).

In January 2013, Tata Steel (KZN) (Pty) Ltd. shut down production at its ferrochromium plant as part of a power buyback agreement with Eskom. Tata's plant had a capacity of 150,000 t/yr; the company was operating one of its two furnaces in early June and planned to restart the second furnace (Davies, 2013; Metal Bulletin, 2013).

FerroChrome Furnaces (Pty) Ltd. was building a new ferrochromium plant in Rustenburg with an initial capacity of 300,000 t/yr. The company planned to increase capacity to 420,000 t/yr by the end of 2016 (Markram, 2014).

PGM producers also mined chromite as a coproduct of mining of Upper Group 2 (UG2) ore in the Bushveld Complex. Production of chromite from UG2 ore had increased in recent years because of the declining profitability of PGM mining resulting from increased labor, power, and other costs. UG2 ore had a much lower production cost than the Lower Group 6 (LG6) chromite ore mined by ferrochromium producers because chromite was a coproduct of PGM mining. Technological advances have allowed ferrochromium producers to use UG2 ore, which had a grade of about 10% Cr_2O_3 that was much lower than the grades in LG6 ore. National capacity of UG2 ore was estimated to be 4.71 Mt/yr in 2012, which was an increase of nearly 35% from 2011 (Ryan's Notes, 2012; d'Harambure, 2013).

Most companies that produced chromite from UG2 ore exported their production to China. UG2 exports, by tonnage, were an estimated 40% of national chromite exports in 2013. Many producers of LG6 ore continued to mine while their ferrochromium plants were partially shut down by power buyback agreements with Eskom and exported their output to China (Markram, 2014).

Lonmin plc of the United Kingdom's sales of chromite were 1.5 Mt in 2013. Anglo American Platinum Ltd. (Amplats) produced 399,500 t of chromite from UG2 ore in 2013 compared with 352,400 t in 2012. Eastern Platinum Ltd. (Eastplats) of Canada sold 81,698 t of chromite from its Crocodile River Mine in 2013 (Lonmin plc, 2013, p. 172; 2014; Anglo American Platinum Ltd., 2014, p. 141; Eastern Platinum Ltd., 2014, p. 6).

ChromTech Holdings planned to start construction on a new ferrochromium plant that would use UG2 ore in 2014. The plant would have an initial capacity of between 68,000 and 70,000 t/yr (Markram, 2014).

Copper.—Palabora Mining Co. Ltd. operated the Palabora Mine, which was the leading producer of copper in South Africa. In 2013, the output of copper in concentrate at Palabora decreased to 41,428 t from 49,063 t in 2012. Smelted copper production at Palabora's smelter increased to 50,872 t in 2013 from 40,576 t in 2012, and refined copper production increased to 50,677 t from 41,724 t. In 2013, Palabora Mining decided to proceed with a feasibility study of extending the life of the mine, which was expected to end in 2015. Rio Tinto Ltd. of Australia and Anglo American plc of the United Kingdom sold their interest in the mine in 2013 (Palabora Mining Co. Ltd., 2014, p. 8, 11, 117–120).

Gold.—The long-term decline in the country's gold output reversed at least temporarily in 2013, with national gold mine production at 159,724 kilograms (kg) compared with a revised 155,286 kg in 2012 and about 375,800 kg in 2003. From 2003 to 2013, employment in gold mining decreased to 131,591 workers from 198,465. During the same period, South Africa's share of world gold production decreased to about 5% from 14%. Decreased production was primarily attributable to mine depths as great as 4 kilometers, which led to difficult mining

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conditions, high ore haulage and refrigeration costs, and low labor productivity (table 1; Chamber of Mines of South Africa, 2013, p. 12, 26; 2015, p. 14; du Venage, 2013b).

Gold Fields Ltd. of South Africa mined gold at the Beatrix, the Driefontein, the Kloof, and the South Deep Mines, which were underground mines. The South Deep Mine produced nearly 9,400 kg in 2013 compared with 8,400 kg in 2012. Gold Fields planned to increase output at South Deep to between 20,200 and 21,700 kilograms per year (kg/yr) by the end of 2017. In February, Gold Fields spun off Beatrix, Driefontein, and Kloof into a separate company called Sibanye Gold Ltd. (Gold Fields Ltd., 2014, p. 10, 21).

Production at Driefontein increased to 18,775 kg in 2013 from 13,728 kg in 2012; at Kloof, to 15,977 kg from 15,350 kg; and at Beatrix, to 9,722 kg from 8,981 kg. In Sibanye's original mining plan, production at Beatrix, Driefontein, and Kloof combined was expected to decrease to about 31,000 kg/yr by 2018, 25,000 kg/yr by 2022, and 19,000 kg/yr by 2024. Reserves at Driefontein were likely to be depleted by 2024; at Beatrix, by 2026; and at Kloof, by 2027. With the development of the West Rand Tailings Retreatment project and other projects, Sibanye planned to maintain production at nearly 44,000 kg/yr through 2022 and to continue mining operations until 2036 (du Venage, 2013b; Sibanye Gold Ltd., 2014, p. 17–18, 25).

AngloGold Ashanti Ltd. operated numerous mines in the Vaal River area near Klerksdorp and the West Wits area near Carletonville. The company's gold production increased to about 40,500 kg in 2013 from 37,700 kg in 2012. Production at the Mponeng Mine was about 11,000 kg in 2013; the surface mining operations in the Vaal River and West Wits areas, 7,500 kg; the Tau Tona Mine, 7,300 kg; the Moab Khotsong Mine, 6,600 kg; the Kopanang Mine, 5,500 kg; and the Great Noligwa Mine, 2,600 kg. The Savuka Mine was merged with the Tau Tona Mine in 2013. Decreased output from Mponeng in 2013 was more than offset by increased output from Kopanang, and Moab Khotsong and the acquisition of Mine Waste Solutions. AngloGold Ashanti planned to produce between 37,000 and 40,000 kg of gold from all its South African operations in 2014 (AngloGold Ashanti Ltd., 2014, p. 44, 68).

Harmony Gold Mining Company Ltd. produced a total of 32,547 kg of gold in 2013. The Target 1 and Target 3 Mines produced a combined 5,702 kg; the Tshepong Mine, 3,855 kg; the surface mining operations, 3,397 kg; the Doornkop Mine, 3,393 kg; the Kusasalethu Mine, 3,149 kg; the Masimong Mine, 3,080 kg; the Joel Mine, 2,819 kg; the Phakisa Mine, 2,528 kg; the Bambanani Mine, 2,232 kg; the Unisel Mine, 1,839 kg; and the Steyn 2 Mine, 553 kg. By 2016, Harmony planned to increase production at Kusasalethu to about 8,900 kg/yr; at Doornkop, to about 6,100 kg/yr; and at Phakisa, to about 5,900 kg/yr (Harmony Gold Mining Company Ltd., 2013a, p. 6–9; 2013b, p. 18; 2014, p. 42–43).

Harmony planned to maintain combined production at the Target 1 and Target 3 Mines at about 6,100 kg/yr; about 4,500 kg/yr at Tshepong; about 3,900 kg/yr at Masimong; about 3,000 kg/yr each at Bambanani and the surface mining operations; about 2,600 kg/yr at Joel; and about 1,900 kg/yr at Unisel. In 2013, Harmony sold the Evander Mine to Pan African Resources plc of the United Kingdom (Harmony Gold Mining Company Ltd., 2014, p. 21).

Gold One International Ltd. produced 8,562 kg of gold in 2013 compared with 7,519 kg in 2012. The Cooke Underground operations produced 4,183 kg in 2013; the Modder East Mine, 3,235 kg; and the Randfontein Surface operations, 1,144 kg. In August 2013, Gold One signed an agreement with Sibanye. In return for a 17% share in Sibanye, Gold One allowed Sibanye to take over the Cooke Underground and the Randfontein Surface operations. From 2014 to 2018, total production at the Cooke Underground and the Randfontein Surface operations was likely to be about 7,800 kg/yr (Gold One International Ltd., 2013, p. 7, 11, 13, 23–24; 2014; Sibanye Gold Ltd., 2014, p. 20).

At the end of 2013, Gold One and Sibanye were engaged in a feasibility study on producing gold from the West Rand tailings retreatment project. Depending on the results of the study, the companies could produce nearly 5,600 kg/yr of gold from retreating tailings. Full capacity would be reached during a 3- to 5-year period (Cornish, 2013g; Sibanye Gold Ltd., 2014, p. 74).

Village Main Reef produced a total of 4,872 kg of gold at the Buffelsfontein, the Blyvoor, the Consolidated Murchison, and the Tau Lekoa Mines in 2013. The company placed Buffelsfontein on care-and-maintenance status and Blyvoor in provisional liquidation in 2013 (Village Main Reef, 2013; 2014, p. 1, 12).

In 2013, DRDGold Ltd. produced 4,360 kg of gold at the Ergo tailings retreatment operations, which are located near Johannesburg. The company opened a new processing plant that was expected to increase gold recovery by between 16% and 20% (Mining Review Africa, 2013; DRDGold Ltd., 2014).

In June 2013, Pan African Resources increased the capacity of the Barberton Mine to about 3,600 kg/yr from 3,000 kg/yr because of the completion of the Barberton Tailings Retreatment Project (BRTP). The estimated life of BRTP was 6 years; Pan African hoped to extend the life of the project to between 13 and 15 years. The estimated life of the Barberton Mine was more than 15 years (Cornish, 2013e).

Pan African also purchased the Evander gold mine from Harmony Gold. Production at Evander was about 3,100 kg/yr; the estimated life of the mine was 15 years. Pan African planned to make a decision on reprocessing tailings at Evander by mid-2014 (Cornish, 2013d).

In 2013, Witswatersrand Consolidated Gold Resources Ltd. (Wits Gold) was engaged in a feasibility study on a new mine at the DBM project. Depending on the results of the study, construction could start in 2014, and mining in 2018. Production was likely to be 6,200 kg/yr during the estimated 18-year life of the mine; peak output was planned to be nearly 7,700 kg in the ninth year of mining. In July, Wits Gold made an offer to purchase the Burnstone Mine from Great Basin Gold Ltd. (GBG) of Canada. Burnstone was on care-on-maintenance status in 2013; production was expected to be about 5,000 kg/yr during the estimated 16-year life of the mine under GBG's mining plan. In December, Sibanye announced plans to purchase Wits Gold (Cornish, 2013a; Engineering & Mining Journal, 2014).

Rand Refinery Ltd. (AngloGold Ashanti, 53%; Gold Fields, 33%; DRDGold, 10%; and Avgold Ltd. and Western Areas Ltd., 2% each) refined most of the newly mined gold in South Africa.

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The company produced at the rate of about 440,000 kg/yr. Rand Refinery sourced the majority of its gold from foreign gold producers (Rand Refinery Ltd., 2013).

Iron Ore and Iron and Steel.—In 2013, iron ore production was about 71.5 Mt compared with 67.1 Mt in 2012 and 38.1 Mt in 2003 because of increased production from the Palabora and the Sishen Mines and the opening of the Khumani and the Kolomela Mines. From 2003 to 2013, employment in iron ore mining increased to 21,145 workers from 5,961 (Chamber of Mines of South Africa, 2013, p. 12, 16; 2015, p. 14).

Kumba Iron Ore Ltd.'s iron ore production decreased to 42.3 Mt in 2013 from 43 Mt in 2012. In 2013, the Sishen Mine produced 30.9 Mt; the Kolomela Mine, 10.8 Mt; and the Thabazimbi Mine, 0.6 Mt. Output decreased at Sishen because of geologic constraints and safety stoppages. At Kolomela, production exceeded the original target of 9 Mt. The remaining life of Kolomela was estimated to be 25 years, and Sishen, 19 years (Kumba Iron Ore Ltd., 2014, p. 4, 7, 10).

In 2013, Kumba revised its plan for steady state production at Sishen to 37 Mt/yr from 41 Mt/yr. The company planned to reach 37 Mt/yr at Sishen by 2016. Kumba was conducting a feasibility study on an expansion of Sishen's capacity by 0.8 Mt/yr and a prefeasibility study on an additional expansion by 2 Mt/yr (Kumba Iron Ore Ltd., 2014, p. 61, 78).

Steady-state production at Kolomela was revised to 10 Mt/yr from 9 Mt/yr in 2013; Kumba was engaged in a prefeasibility study on a capacity expansion to 15 Mt/yr in 2013. Depending on the results of the study, Kumba planned to start a feasibility study in 2015. The company was also engaged in a feasibility study on Project Infinity, which could extend the life of the Thabazimbi Mine through at least 2023 and increase production to 2 Mt/yr (Kumba Iron Ore Ltd., 2014, p. 40, 76, 78).

Assmang produced iron ore at the Beeshoek and the Khumani Mines. In 2013, production at Beeshoek and Khumani increased to 16 Mt from 15 Mt in 2012. Assmang started mining at the East Pit at Beeshoek; the development of the East Pit was expected to prolong the mine's life until 2018 (African Rainbow Minerals Ltd., 2013a, p. 74, 79; 2013b, p. 58; 2014, p. 59).

In 2013, Palabora Mining produced 6.52 Mt of magnetite at Palabora compared with 5.28 Mt in 2012. Increased production was attributable to improvements in logistics. The company was engaged in an expansion of its capacity to 9 Mt/yr (Palabora Mining Co. Ltd., 2013, p. 2, 8).

Evraz Highveld Steel and Vanadium Ltd. (a subsidiary of Evraz Group S.A. of Luxembourg) mined 2.08 Mt of magnetite from the Mapochs Mine in 2013 compared with 1.78 Mt in 2012. Iron ore from Mapochs was consumed in Highveld's steel mill at Witbank; the company's crude steel output was 638,912 t in 2013 compared with 620,035 t in 2012. Highveld planned to increase its steel output to nearly 820,000 t in 2014 (Evraz Highveld Steel and Vanadium Ltd., 2014, p. 15, 18).

Cape Town Iron & Steel Works (Pty) Ltd. (Cisco) announced plans to reopen its electric arc furnace (EAF) in Cape Town by August or early September 2013. Cisco planned to produce 300,000 t/yr by late 2013 and to increase output to 400,000 t/yr by 2014. About 280,000 t/yr would be consumed domestically and 120,000 t/yr would be exported. By 2016, Cisco also planned to open a new EAF with a capacity of 600,000 t/yr in Johannesburg (Christie, 2013).

Lead, Silver, and Zinc.—The Black Mountain Mine, which was operated by Vedanta Resources plc of the United Kingdom, produced copper, lead, silver, and zinc. Lead mine production decreased by 20%, and zinc mine production, by nearly 19% in 2013. The mine produced about 50,000 kg/yr of silver; the remainder of South Africa's silver production was attributable to gold and PGM mines. Vedanta was considering the development of the Gamsberg Mine. Depending on the results of a feasibility study, the mine could produce 400,000 t/yr of zinc from the Gamsberg North deposit during an estimated 20-year life (Vedanta Resources plc, 2013, p. 10).

Manganese.—In 2013, manganese ore production was about 10.96 Mt compared with 8.94 Mt in 2012 and 3.55 Mt in 2003 because of increased production from the Mamatwan, the Nchwaning, and the Wessels Mines and the opening of the Kalahari, the Kudumane, and the Tshipi Borwa Mines. From 2003 to 2013, employment in manganese mining increased to 9,866 workers from 2,623 (Chamber of Mines of South Africa, 2013, p. 12, 17; 2015, p. 14).

Assmang produced manganese ore at the Gloria and the Nchwaning Mines. Output at Gloria and Nchwaning increased to about 3.44 Mt in 2013 from 3.09 Mt in 2012. In 2013, the company approved an expansion of Nchwaning's capacity to 4 Mt/yr from 3 Mt/yr (African Rainbow Minerals Ltd., 2013a, p. 74, 80; 2013b, p. 58–60; 2014, p. 59, 61).

In 2013, Assmang decreased output to 327,000 t of ferromanganese at its Cato Ridge and Machadodorp from 357,000 t in 2012. The company converted its remaining ferrochromium furnaces at Machadodorp to ferromanganese. Assmang also shut down inefficient ferromanganese furnaces at Cato Ridge and Machadodorp (African Rainbow Minerals Ltd., 2013a, p. 71, 80; 2013b, p. 58; 2014, p. 59).

Hotazel Manganese (Pty) Ltd. (BHP Billiton, 44.4%, and Anglo American, 29.6%) operated the Mamatwan open pit mine and the Wessels underground mine near Hotazel in Northern Cape Province. In 2013, Hotazel's production of manganese ore decreased to 3.61 Mt from 3.66 Mt in 2012. The company planned a two-phase project to increase ore production at Wessels to 1.5 Mt/yr from 1 Mt/yr. The first phase was expected to be completed by mid-2014; Hotazel was engaged in a feasibility study on the second phase in 2013. The estimated life of the Wessels Mine was 48 years, and the Mamatwan Mine, 20 years (BHP Billiton Ltd., 2013a, p. 41–42; 2013b, p. 4; 2014, p. 24).

In 2013, Samancor Manganese (Pty) Ltd. (BHP Billiton, 44.4%, and Anglo American, 29.6%) produced 370,000 t of manganese alloys at its Meyerton plant compared with 340,000 t in 2012. The plant, which had the capacity to produce 500,000 t/yr of ferromanganese, consumed more than 25% of the ore mined at Mamatwan and Wessels. The production of silicomanganese, which was more energy-intensive than ferromanganese, shut down in January 2012 (BHP Billiton Ltd., 2013a, p. 41; 2013b, p. 4; 2014, p. 24).

In 2012, United Manganese of Kalahari (Pty) Ltd. (UMK) (Majestic Silver Trading 40 (Pty) Ltd., 51%, and Renova Group of Russia, 49%) mined more than 2.7 Mt at the Kalahari

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manganese ore deposit. UMK was producing at the rate of 3 Mt/yr in mid-2013; the company planned to increase output to 4 Mt/yr. Plans to increase production could be constrained by the rail network (Ryan's Notes, 2013f, h).

Manganese from the Kalahari deposit was consumed by Transalloys (Pty) Ltd. (a subsidiary of Renova) in the production of silicomanganese. In March 2013, Renova signed an agreement with Majestic Silver Trading to increase the capacity at Transalloys to 360,000 t/yr of silicomanganese from 180,000 t/yr by 2015. Majestic Silver Trading also would acquire a share in Transalloys (Renova Group, 2013).

BEE company Ntsimbitntle Mining (Pty) Ltd. held a 50.1% share in Tshipi e Ntle Manganese Mining (Pty) Ltd., and Jupiter Mines Ltd. of Australia, a 49.9% share. In December 2012, Jupiter and Ntsimbitntle started the export of ore from the new Tshipi Borwa Mine, which was adjacent to the Mamatwan Mine. The mine was expected to reach its full capacity of 2.4 Mt/yr of ore at a grade of 37% manganese in 2014 (Mining Journal, 2013a).

Kalagadi Manganese (Pty) Ltd. (ArcelorMittal of Luxembourg, 50%; Kalahari Resources (Pty) Ltd., 40%; and IDC, 10%) planned to start production at a new underground mine at Hotazel in the first half of 2014. Output was expected to be 3 Mt/yr of manganese ore at a grade of 38%; Kalagadi completed a plant to beneficiate the mine's output into 2.4 Mt/yr of sintered ore in 2013. The sintering plant, which had a capacity of 3.7 Mt/yr, started to process at least 400,000 t of ore processed from other South African producers before production started at the mine. Kalagadi was also considering the purchase of ore to fill the plant's excess capacity after the mine reached its full capacity (Ryan's Notes, 2013f, g; Williams, 2013).

About 1.7 Mt/yr of the mine's sintered output was likely to be exported. Kalagadi also planned to build a new ferromanganese plant at Coega with a capacity of 320,000 t/yr by early 2015; the plant was expected to consume about 700,000 t/yr of the mine's sintered output. Kalahari (which was a BEE company) planned to buy ArcelorMittal's 50% share in Kalagadi (Williams, 2013).

Asia Minerals Ltd. (AML) of Hong Kong started exports from its new Kudumane Mine in April 2013. The company planned to produce 1.5 Mt of manganese ore in 2013, 2.5 Mt in 2014, and 3 Mt in 2015. Production at full capacity was likely to be about 2 Mt/yr of ore at a grade of between 37% and 38% manganese and 1 Mt/yr of ore at a grade of 42% manganese. Mining of the lower grade ore started in 2013, and mining of the higher grade ore was planned for 2014. By 2015, AML planned to complete a plant that would produce sintered ore at a grade of between 44% and 45% manganese (Tex Report, The, 2012; Letaba, 2013).

Afarak planned to convert one of its unused silicomanganese furnaces at Mogale to ferrochromium by the third quarter of 2014 because the company had its own supply of chromite but not manganese ore. The furnace had a capacity of nearly 17,000 t/yr. In early 2013, Manganese Metal Co. (MMC) was producing refined manganese metal at a rate of 30,000 t/yr (Ryan's Notes, 2013e).

In November 2013, Globe Speciality Metals Inc. of the United States purchased Silicon Technology Ltd., which held a ferrosilicon plant with a capacity of 45,000 t/yr. The plant was not operating in late 2013; Globe planned to restart production in the second half of 2014 (Ryan's Notes, 2013d).

In mid-2012, Lehating Mining (Pty) Ltd. completed a feasibility study on its new Lehating Mine with favorable results. The company submitted its mining license application and its environmental impact assessment in October 2012 and August 2013, respectively. Lehating Mining expected to receive its mining license in 2014. In late 2013, the company was seeking financing for its mine, which was likely to cost about $150 million. Mining could start in 2017, depending on successfully obtaining financing; output was planned to be 600,000 t/yr of ore at a grade of more than 44% manganese during the estimated 14-year life of the mine (Cornish, 2013c).

Nickel.—The majority of South Africa's nickel mine production was a coproduct of PGM mining. Anglo American Platinum Ltd. (Amplats) produced 16,800 t of refined nickel in 2013 compared with 17,700 t in 2012; the company also produced 5,800 t of nickel in matte. About 18,300 t of nickel was mined at the company's PGM mining operations in 2013. Impala Platinum Holdings Ltd. (Implats) produced 16,400 t of refined nickel in 2013, of which about 4,100 t was attributable to the company's PGM mining operations (Impala Platinum Holdings Ltd., 2013, p. 59, 66, 76; 2014; Anglo American Platinum Ltd., 2014, p. 141, 145–160).

ARM and Norilsk produced 23,821 t of nickel at the Nkomati Mine in 2013 compared with 19,248 t in 2012 as the mine ramped up to full capacity. The company planned to maintain production at about 20,500 t/yr (African Rainbow Minerals Ltd., 2013a, p. 5, 64; 2013b, p. 64–65; 2014, p. 65).

Platinum-Group Metals.—In 2013, platinum-group metal (PGM) mine production was 264,188 kg compared with 254,338 kg in 2012 and about 233,100 kg in 2003. From 2003 to 2013, the share of platinum in PGM production, by amount, decreased to 52% from 62%. During the same period, employment in PGM mining increased to 191,261 workers from 127,672 (table 1; Chamber of Mines of South Africa, 2013, p. 12, 33; 2015, p. 14).

In 2013, Amplats produced 142,000 kg of refined PGMs compared with 144,300 kg in 2012. About 117,300 kg was attributable to mining operations of Amplats and its joint-venture partners in 2013, of which platinum accounted for 61,339 kg; palladium, 36,404 kg; rhodium, 7,968 kg; and other PGMs, about 11,600 kg (Anglo American Platinum Ltd., 2014, p. 141, 145–160).

In 2013, PGM production at Amplats' Mogalakwena Mine amounted to 22,151 kg; the Kroondal Mine, 15,816 kg; the Tumela Mine, 12,665 kg; the Union Mine, 10,031 kg; the Modikwa Platinum Mine, 9,602 kg; the Mototolo Mine, 8,093 kg; the Khuseleka Mine, 8,015 kg; the Dishaba Mine, 7,723 kg; the Batholope Mine, 6,961 kg; and the Khomanai Mine, 3,592 kg. The Khomanai Mine was put on care-and-maintenance status in August 2013. From 2009 to 2013, output at Mogalakwena increased by 41% and output at Union and Tumela decreased by 41% and 25%, respectively. Production at the mines managed by Amplats was likely to remain unchanged in 2014 (Anglo American Platinum Ltd., 2014, p. 80, 145–160).

Atlatsa Resources Corp. operated the Bokoni Mine, which produced PGMs at the rate of about 5,300 kg/yr. Atlatsa and

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Amplats planned to increase production to about 7,800 kg/yr by 2019. The estimated life of the mine was more than 95 years (Atlatsa Resources Corp., 2014).

Royal Bafokeng Platinum Ltd. (RBPlat) operated the Bafokeng Rasimone Platinum Mine. Sales of PGMs were 9,396 kg in 2013, including 5,641 kg of platinum. RBPlat was building a new mine at the Styldrift project; the company planned to start mining in the third quarter of 2015 and to ramp up to full capacity by the second quarter of 2018. Production of platinum at Styldrift was likely to be 6,800 kg/yr, and palladium, rhodium, and gold, a total of 3,100 kg/yr (Projects in Progress, 2012a; Royal Bafokeng Platinum Ltd., 2013, p. 49–50; 2014, p. 62).

In 2013, Implats produced 93,808 kg of refined PGMs compared with 95,640 kg in 2012. About 49,200 kg was attributable to Implats' South African mining operations, of which platinum accounted for about 25,100 kg; palladium, 13,300 kg; rhodium, 3,700 kg; and other PGMs, about 7,100 kg. The remainder was attributable to the Two Rivers joint venture with ARM, company operations in Zimbabwe, recycling, and toll refining (Impala Platinum Holdings Ltd., 2013, p. 59, 66, 76, 87–88; 2014).

The Impala Mines near Rustenburg in North West Province produced 42,930 kg of PGMs in 2013, of which 22,740 kg was platinum and 10,820 kg was palladium. In 2013, platinum output at Marula was about 2,390 kg, and palladium, about 2,440 kg. Implats planned to increase platinum production at the Impala Mines to about 26,400 kg/yr by 2018 by sinking new mine shafts. The company also planned to increase platinum production at Marula to 2,600 kg/yr by 2018 (Impala Platinum Holdings Ltd., 2013, p. 59, 66, 69, 76–77; 2014).

ARM and Implats operated the Two Rivers Mine; output increased to 11,335 kg of PGMs in 2013 from 10,465 kg in 2012. Production was expected to be maintained at about 10,900 kg/yr of PGMs (African Rainbow Minerals Ltd., 2013a, p. 55, 63; 2013b, p. 64–65; 2014, p. 64).

In 2013, Lonmin produced 45,082 kg of refined PGMs compared with 41,391 kg in 2012. Lonmin's mining operations produced 42,914 kg of PGMs in 2013, of which platinum accounted for 23,033 kg; palladium, 10,638 kg; ruthenium, 4,933 kg; rhodium, 3,214 kg; and iridium, 1,097 kg. Most of the mine production was attributable to the Marikana Mine. Lonmin planned to maintain sales at more than 23,000 kg/yr of platinum (Lonmin plc, 2013, p. 170–171; 2014).

Northam Platinum Ltd. operated the Booysendal and the Zondereinde Mines. In 2013, Booysendal and Zondereinde produced a total of about 6,400 kg of platinum, 3,000 kg of palladium, and 810 kg of rhodium. Northam started mining at Booysendal in 2013; the company produced about 5,700 kg of platinum, 2,800 kg of palladium, and 740 kg of rhodium at Zondereinde in 2012. Booysendal's planned production at full capacity was about 5,000 kg/yr of PGMs (CPM Group, 2014, p. 15, 114–115, 181).

In late 2012, ARM and Norilsk completed the expansion of the Nkomati nickel mine. Output increased to 4,251 kg of PGM in 2013 from 2,883 kg in 2012 (African Rainbow Minerals Ltd., 2013a, p. 64; 2013b, p. 64–65; 2014, p. 65).

Platmin Ltd. of Canada produced about 2,300 kg of platinum, 810 kg of palladium, and 180 kg of rhodium at Pilanesberg in 2013 compared with about 1,600 kg of platinum, 590 kg of palladium, and 160 kg of rhodium in 2012. In 2014, palladium and platinum production was expected to increase by about 50% (CPM Group, 2014, p. 15, 115, 181).

In 2013, Glencore Xstrata produced 1,369 kg of PGMs at the Eland Mine, which was an increase of 37% from 2012. Production increased because of the rampup of output from the Western decline area (Glencore Xstrata plc, 2014, p. 60).

In 2013, Tharisa completed its new processing plant that increased PGM capacity at the Tharisa Mine to nearly 4,900 kg/yr from 1,200 kg/yr. Between October 2012 and March 2013, Tharisa produced 870 kg of PGMs. The company planned to produce between 2,500 kg and 2,800 kg in fiscal year 2014 and to reach steady-state production of 4,500 kg/yr in fiscal year 2016. In 2013, Sylvania Platinum Ltd. produced about 780 kg of platinum, 500 kg of palladium, and 280 kg of rhodium from its chromite tailings retreatment plants (Projects in Progress, 2012b; CPM Group, 2014, p. 15, 115, 181; Tharisa Minerals (Pty) Ltd., 2014a, b).

Eastplats sold 851 kg of PGMs from the Crocodile River Mine in 2013 compared with 2,682 kg in 2012. Sales of platinum decreased to 431 kg in 2013 from 1,348 kg in 2012, and sales of palladium, to 183 kg from 591 kg. Eastplats put the Crocodile River Mine on care-and-maintenance status in August 2013 (Eastern Platinum Ltd., 2014, p. 2, 6).

Platinum Group Metals Ltd. of Canada was engaged in the development of the Western Bushveld Joint Venture (WBJV) project. The company and its joint-venture partner Wesizwe Platinum Ltd. planned to produce nearly 8,600 kg/yr of PGMs (not including ruthenium or iridium) at a new mine. Initial production at WBJV was planned for mid-2015; the estimated life of the mine was more than 20 years. Wesizwe decided not to fund its share of the operations in October 2013; the project could be delayed as a result (Mining Journal, 2013b).

In 2013, Wesizwe was engaged in the development of the Bakubung Mine, which was expected to produce about 10,900 kg/yr of PGMs. Production was likely to start in 2017 or 2018; the estimated life of the mine was more than 30 years. Wesizwe also was considering the development of its own smelter for the Bakubung Mine (du Venage, 2013a).

Selenium and Tellurium.—Implats and its partners produced about 9,000 kg/yr of selenium and 4,000 kg/yr of tellurium from their PGM mining operations. In the first half of 2013, sales of anode slimes from Palabora Mining's copper operations were running at the rate of more than 130,000 kg/yr. The average selenium and tellurium content of the anode slimes was 4% and 2%, respectively (Palabora Mining Company Ltd., 2013, p. 8; [undated]; Paul Finney, Group Executive—Refining, Impala Platinum Ltd., written commun., March 8, 2013).

Silicon, Titanium, and Zirconium.—Grupo Ferroatlantica S.A. was South Africa's only producer of silicon metal; the company also produced ferrosilicon. In the first quarter of 2013, Grupo Ferroatlantica shut down 60% of its capacity at its Polokwane and Rand Carbide plants as part of a power buyback agreement with Eskom. The company shut down all production in April and May; total production losses were estimated to be 22,000 t of silicon metal and 8,000 t of ferrosilicon (Ryan's Notes, 2013c).

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Richards Bay Minerals (RBM) (Rio Tinto plc of the United Kingdom, 74%; Blue Horizon Investments, 24%; and RBM permanent employees, 2%) was South Africa's leading producer of ilmenite, rutile, and zircon; the company also processed ilmenite to titanium slag. In 2012 (the latest year for which data were available), RBM's titanium slag production decreased to 880,800 t from 1.04 Mt in 2011, and rutile production, to 97,500 t from 100,400 t. Zircon production remained nearly unchanged at 263,700 t in 2012. RBM put its rutile and zircon operations on hold in early 2013; the company resumed limited zircon production in the second quarter because of improving market conditions (Rio Tinto plc, 2013, p. 7).

From January 1 through June 15, 2012, Tronox Ltd. of the United States (Exxaro Resources Ltd., 44.65%) KZN Sands project in Kwa Zulu Natal Province produced at the rate of about 320,000 t/yr of ilmenite, 20,000 t/yr of zircon, and 15,000 t/yr of rutile. In 2013, output at KZN Sands was 291,000 t of ilmenite, 10,000 t of zircon, and 6,000 t of rutile. KZN Sands shut down in December as reserves were depleted at the Hillendale Mine. From January 1 through June 15, 2012, the Namakwa Sands project in Western Cape Province produced at the rate of about 400,000 t/yr of ilmenite, 120,000 t/yr of zircon, and 40,000 t/yr of rutile. In 2013, output at Namakwa Sands was 459,000 t of ilmenite, 111,000 t of zircon, and 27,000 t of rutile (Exxaro Resources Ltd., 2013, p. 6–7; Tronox Ltd., 2014, p. 1, 27).

Tronox planned to start production at the Fairbreeze Mine in Kwa-Zulu Natal Province, which would replace Hillendale, in the second half of 2015. The company planned to produce 600,000 t/yr of ilmenite, 60,000 t/yr of zircon, and 30,000 t/yr of rutile over Fairbreeze's estimated 15-year life. At the end of 2013, development was on hold because of an appeal to the Government's decision to grant a water use permit to Tronox. The appeal was based on environmental concerns (Tronox Ltd., 2014, p. 2, 8, 29).

In the third quarter of 2013, Mineral Commodities Ltd. of Australia started construction on the Tormin Mine in Western Cape Province. The company planned to start production by yearend. Output was expected to be about 100,000 t/yr of ilmenite, 38,200 t/yr of zircon, and 5,700 t/yr of rutile; the estimated life of the mine was 5 years (Maphango, 2014).

Most of the titanium slag produced in South Africa was exported before additional processing. Huntsman International LLC of the United States operated a titanium dioxide (TiO_2) pigment plant at Umbogintwini with a capacity of 25,000 t/yr. In May 2013, Nyanza Light Metals Ltd. (Arkein Industrial Holdings Ltd. of Mauritius, 80%, and Highveld, 20%) completed a prefeasibility study on a new TiO_2 pigment plant with favorable results. Nyanza planned to complete a feasibility study by early 2015. Depending on the results of the study, the company could produce 50,000 t/yr of TiO_2 pigment starting in the third quarter of 2016. Pigment would be produced using titanium-rich wastes from Highveld's iron ore and vanadium mining operations (Hughes and Ollett, 2013).

Rare Metal Industries (RMI), which was a joint venture of the Government-owned companies Industrial Development Corp. (IDC) and National Empowerment Fund, Magnesium & Metals of Russia, and TJTI (Pty) Ltd., planned to start a feasibility study in November 2013 on a new silicon, titanium, and zirconium plant. Planned production was 15,000 t/yr of titanium metal, 2,000 t/yr of zirconium metal, and 1,900 t/yr of silicon metal and other silicon products. Depending on the results of the study, RMI could start construction in 2015 and production in late 2017. The estimated cost of the project was about $2 billion (Maphango, 2014).

The Council for Scientific and Industrial Research (CSIR) started producing titanium metal powder at a pilot plant using an experimental production process. By 2017, CSIR hoped to produce 500 t/yr of titanium metal powder from a new plant. Depending on the success of the new plant, a large-scale plant with a capacity of 20,000 t/yr could be opened between 2021 and 2023 (Campbell, 2013).

Vanadium.—Evraz Group S.A. produced vanadium from titaniferous magnetite at the Mapochs and the Vametco Vanadium Mines, which were operated by Highveld and Vametco Minerals Corp., respectively. Highveld produced vanadium slag from the lumpy ore at Mapochs; the slag was sold to Germany for processing into ferrovanadium and to Vametco for processing into other products. In 2013, the content of V_2O_5 in vanadium slag was about 11,800 t at Mapochs; output was constrained by high power costs and unplanned shutdowns for maintenance. Highveld planned to increase production to more than 16,000 t of V_2O_5 in 2014 (Evraz Highveld Steel and Vanadium Ltd., 2014, p. 15, 20).

Vanchem Vanadium Products (Pty) Ltd. (a subsidiary of Duferco Group of Luxembourg) purchased fine ore from the Mapochs Mine for processing into ferrovanadium and other products. From the beginning of October 2012 to the end of September 2013, Vanchem's output of contained vanadium was more than 3,900 t (Duferco Group, 2014, p. 35).

GlencoreXstrata produced V_2O_5 and ferrovanadium at the Rhovan Mine and smelter in Brits. In 2013, production of V_2O_5 at Rhovan increased to about 9,800 t from about 9,600 t in 2012. About 7,000 t of Rhovan's output was processed into ferrovanadium in 2013 (Glencore Xstrata plc, 2014, p. 60).

In 2013, Ironveld plc of the United Kingdom completed a prefeasibility study with favorable results on a new mine at its Ironveld Pig Iron project, which is located on the Northern Limb of the Bushveld Complex. Ironveld planned to mine 2.4 Mt/yr of magnetite, which would be processed at the company's new smelters into 1 Mt/yr of pig iron and 9,670 t/yr of ferrovanadium. Large-scale production was planned to start in 2019 depending on successful results of its feasibility study; the company planned initial production of 46,000 t/yr of pig iron and 445 t/yr of ferrovanadium from a smaller smelter starting in 2015 (Ratshomo, 2014).

Industrial Minerals

Cement.—South Africa had four cement producers with a total capacity of 17.9 Mt/yr. Pretoria Portland Cement Co. (Pty) Ltd. had six plants with a combined capacity of 8 Mt/yr; the company planned to increase the capacity of its De Hoek and Riebeck plants by 50% by 2016. AfriSam Consortium (Pty) Ltd., which had a combined capacity of 4.6 Mt/yr at its Dudfield, Roodeport, and Ulco plants, planned to complete a new plant at Coega with a capacity of 740,000 t/yr by 2015 (Turner, 2013).

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In late 2013, Sephaku Cement (Pty) Ltd. (Dangote Industries Ltd. of Nigeria, 64%) had completed 95% of the construction on its new clinker grinding plant near Delmas in Mpumalanga Province. Sephaku Cement planned to start production in early 2014. The company also planned to start production at its new Aganang integrated cement plant in Lichtenburg in North West Province by mid-2014. The cement production capacity at the Delmas plant was expected to be 1.4 Mt/yr, and at Aganang, 1.2 Mt/yr (Edwin and Fourie, 2014; International Cement Review, 2014).

Osho Ventures Group of the United Arab Emirates planned to start construction on two new clinker grinding plants near Port Elizabeth and Richards Bay in February 2014. The plants would have a capacity of 600,000 t/yr each of cement; completion was scheduled for the end of 2014 (International Cement Review, 2013).

Diamond.—In 2013, diamond production was 8.17 million carats compared with 7.25 million carats in 2012 and 12.6 million carats in 2003 because of decreased production at the Cullian, the Finsch, and the Venetia Mines. From 2003 to 2013, employment in diamond mining decreased to 13,547 workers from 17,949 (table 1; Chamber of Mines of South Africa, 2013, p. 12, 14; 2015, p. 14).

De Beers Group accounted for the majority of South Africa's rough diamond production. In 2013, the company's total output from the Kimberley Surface Mining Operations, the Venetia Mine, and the Voorspoed Mine increased to 4.72 million carats from 4.43 million carats in 2012. De Beers planned to build an underground mine at Venetia that would extend the life of the project by at least 24 years. Production from the new mine would start in 2021 and reach the full capacity of 4 million carats per year in 2024. The estimated cost of the new mine was about $2.1 billion. The Voorspoed Mine was expected to produce 800,000 carats per year until the expiration of its mining license in late 2023. Production at the Kimberley Surface Mining Operations was also expected to continue until 2023 (Mining Journal, 2013b; Janse, 2014).

In 2013, diamond production at the Finsch Mine by Petra Diamonds Ltd. amounted to 1.74 million carats; the Cullinan Mine, 921,549 carats; the Kimberley Underground Mine, 119,532 carats; the Helam Mine, 45,241 carats; and the Koffiefontein Mine, 44,272 carats. The Sedibeng and the Star Mines remained on care-and-maintenance status in 2013. Petra planned to ramp up production at Cullinan to 2.2 million carats per year in 2019 and at Finsch, to 1.9 million carats per year. The company also planned to increase production at the Kimberley Underground and the Koffiefontein Mines to 135,000 carats per year and 100,000 carats per year, respectively, in 2016. The estimated remaining life of the Cullinan and the Finsch Mines was 18 years each; the Koffiefontein Mine, 13 years; and the Kimberley Underground Mine, 10 years (Mining Journal, 2013a; Petra Diamonds Ltd., 2014, p. 9–15).

Trans Hex Group produced 61,204 carats from alluvial operations on the lower Orange River in 2013 and Rockwell Diamonds Ltd. produced about 20,000 carats from alluvial operations on the middle Orange River. Mwana Africa plc of the United Kingdom recovered about 15,000 carats from tailings at its Marsfontein kimberlite mine (Janse, 2014).

DiamondCorp plc of the United Kingdom planned to reopen the Lace Mine in 2014 and to reach the full capacity of 500,000 carats per year in the second half of 2015. Reserves at the Lace Mine were estimated to be 13.5 million carats (Janse, 2014).

Fluorspar.—Minerales Y Productos Derivados SA (Minersa) of Spain held an 85% share in the Vergenoeg Mine, which was South Africa's only active fluorspar mine at the end of 2013. Vergenoeg's capacity of acid-grade fluorspar had reached 250,000 t/yr by March 2013; minimal changes to the processing plant's design could increase capacity to 300,000 t/yr. Minersa also increased metal-grade fluorspar powder and briquet capacity to 30,000 t/yr (Modiselle, 2014b).

Fluormin plc placed the Witkop Mine on care-and-maintenance status in October 2012 in spite of cost reductions and improved performance; world market prices for fluorspar were lower than costs. The company sold the Buffalo Mine, which had been on care-and-maintenance status since 2008, to Rooiberg Stone (Pty.) Ltd. in February 2013. Rooiberg started processing the Buffalo Mine's stockpiles to produce aggregates (Modiselle, 2014b).

Sephaku Fluoride Ltd. (SepFluor) planned to start production at the Nokeng fluorspar project by the fourth quarter of 2014. In the first 9 years of the project, SepFluor planned to produce 185,000 t/yr of acid-grade fluorspar from the Plattekop deposit. Production was expected to decrease subsequently to 130,000 t/yr as mining shifted to the Outwash Fan deposit. SepFluor also planned to build a new processing plant that would consume 130,000 t/yr of fluorspar and 156,000 t/yr of sulfuric acid in the production of 60,000 t/yr of hydrogen fluoride (HF). About 42,600 t/yr of HF was expected to be consumed in the production of 60,000 t/yr of aluminum fluoride (AlF_3). National consumption of AlF_3 was estimated to be about 28,000 t/yr, all of which was imported (Sephaku Fluoride Ltd., 2013, p. 4, 18, 21).

Kyanite, Andalusite, and Related Minerals.—South Africa was the world's leading producer of andalusite. In 2012, national production decreased to 163,801 t from 186,242 t in 2011 because of commissioning problems at processing plants, decreased domestic demand from ferroalloy and iron and steel producers, and decreased export demand because of economic conditions in Europe (Modiselle, 2014a).

At the start of 2013, Imerys South Africa (Pty) Ltd. (a subsidiary of Imerys Group of France) operated the Annesley, the Havercroft, the Krugerspost, and the Thabazimbi (Rhino) Mines, which had a combined capacity of 225,000 t/yr. By mid-2014, the company planned to increase capacity to 290,000 t/yr through debottlenecking programs at Krugerspost and Thabazimbi and opening the Segorong Mine. Expansion plans were subsequently revised to a combined capacity of 250,000 t/yr; expenditures were much higher than initially planned. Imerys closed the Havercroft Mine in February and started operations at the Segorong Mine, which had a capacity of 55,000 t/yr, in March (Feytis, 2011; Carmichael and Lismore-Scott, 2013; Modiselle, 2014a).

In mid-2010, Andalusite Resources (Pty) Ltd. increased the capacity at its Maroeloesfontein Mine to 70,000 t/yr from 40,000 t/yr. The company planned a further increase in capacity

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to between 80,000 t/yr and 100,000 t/yr by the end of 2012; expansion plans were revised subsequently to 120,000 t/yr by 2015. The life of the Maroeloesfontein Mine was estimated to be about 60 years (Feytis, 2011; Carmichael and Lismore-Scott, 2013).

Phosphate Rock.—Foskor (Pty) Ltd. was South Africa's only producer of phosphate rock. In 2013, phosphate rock production decreased to 2.13 Mt from 2.24 Mt in 2012; lower output was attributable to problems with ore crushing facilities and unusually heavy rainfall. Foskor consumed about 70% of its phosphate rock in the production of phosphoric acid, which was used to produce fertilizers. Between 15% and 20% of Foskor's output was exported to Japan, the Netherlands, and New Zealand, and the remainder was sold to domestic consumers. The company planned to start further downstream processing of its fertilizer output to NPK fertilizers (which contained nitrogen, phosphorus, and potassium). Farmers World Limpopo (Pty) Ltd. also produced fertilizers and operated the phosphoric acid plant formerly held by Sasol Ltd. (Muravha, 2014).

Rare Earths.—In 2013, Great Western Minerals Group Ltd. (GWMG) of Canada completed a preliminary economic assessment on reopening the Steenkampskraal Mine in Western Cape Province with favorable results. GWMG and Ganzhou Qiandong of China planned to build a rare-earths separation plant that would process rare-earth chlorides from Steenkampskraal to about 5,000 t/yr of rare-earth oxides. Mining could start within 24 months of obtaining the necessary financing; rare-earth oxide production was expected to start within 12 months of rare-earth chloride production (Engineering & Mining Journal, 2013).

In March 2013, Galileo Resources plc of the United Kingdom completed a preliminary economic assessment of a a new mine at its Glenover Rare Earth project with favorable results. Galileo could produce about 7,000 t/yr of rare-earth oxides during an estimated 24-year mine life. The company was also considering the production of ammonium sulfate, phosphate products, and scandium from mine-processing waste streams (Galileo Resources plc, 2013).

Frontier Rare Earths Ltd. of Luxembourg and Korea Resources Group (Kores) planned to complete a prefeasibility study on a new mine at the Zandkopsdrift rare-earths project in 2014. The companies planned to complete a feasibility study between 9 and 12 months after the completion of the prefeasibility study. Depending on the results of the studies, Frontier and Kores could start mining at Zandkopsdrift by 2017. The mine's production would be processed at a rare-earths separation plant at Saldhanha Bay with a capacity of 20,000 t/yr of rare-earth oxides (Frontier Rare Earths Ltd., 2014).

Vermiculite.—South Africa was the world's leading producer of vermiculite. In 2013, Palabora Mining's production at the Palabora Mine decreased by 4%. In recent years, decreased output was attributable to reduced demand and increased competition in the European and North American markets. Vermiculite from the Palabora Mine was increasingly fine grained and superfine grained because of decreased grades and recovery rates. Palabora Mining planned to increase production to 150,000 t/yr by late 2015. The remaining life of the mine was estimated to be 24 years with output at the capacity of 200,000 t/yr (Elliott, 2012; Torrisi and Patel, 2014).

Mineral Fuels and Related Materials

Coal.—In 2013, coal production was about 256.3 Mt compared with a revised 259 Mt in 2012 and 237.9 Mt in 2003. From 2003 to 2013, employment in coal mining increased to 87,768 workers from 47,239 (table 1; Chamber of Mines of South Africa, 2013, p. 12, 19; 2015, p. 14).

Anglo American's coal production was 56.6 Mt in 2013 compared with 57.1 Mt in 2012. The New Vaal Mine produced 17.1 Mt in 2013; the Kriel Mine, 8.1 Mt; the Isibonelo Mine, 5.07 Mt; the Zibulo Mine, 4.87 Mt; the Goedehoop Mine, 4.68 Mt; the Landau Mine, 4.08 Mt; the Kleinkopje Mine, 4 Mt; the New Denmark Mine, 3.59 Mt; the Greenside Mine, 3.27 Mt; and the Mafube Mine, 1.83 Mt. Anglo American was engaged in a feasibility study on the New Largo Mine, which could produce 11 Mt/yr of thermal coal (Anglo American plc, 2014, p. 67, 252).

In 2013, Exxaro's coal production was about 38.8 Mt compared with 40 Mt in 2012. Output at the Grootegeluk Mine was 17.8 Mt in 2013; the Matla Mine, 10.1 Mt; the Leeuwpan Mine, 3.8 Mt; the North Block Complex, 2.67 Mt; the Arnot Mine, 1.63 Mt; the New Clydesdale Mine, 419,000 t; and the Tshikondeni Mine, 343,000 t. Exxaro had completed 96% of the expansion of Grootegeluk's capacity by 14.6 Mt/yr in 2012; Grootegeluk was expected to produce 36 Mt/yr by 2017 (Chamber of Mines of South Africa, 2013, p. 20; 2015, p. 22; Tex Report, The 2014b).

In fiscal year 2013, Sasol Ltd.'s salable coal production increased to 38.6 Mt from 38.4 Mt in fiscal year 2012. Total production was 40.1 Mt, of which the Syferfontein Mine accounted for 9.6 Mt; the Bosjesspruit Mine, 8 Mt; the Middelbult Mine, 7.4 Mt; the Brandspruit Mine, 7.3 Mt; the Twistdraai Mine, 6.1 Mt; and the Sigma Mine, 1.7 Mt. Sasol planned to complete the new Impumelelo Mine to replace the Brandspruit Mine in the second half of 2014 and the new Shondoni Mine to replace the Middelbult Mine in the second half of 2015 (Sasol Ltd., 2013, p. 37, 39).

BHP Billiton Energy Coal South Africa Ltd. (BESCA) produced coal at the Khutala, the Klipspruit, the Middelburg, and the Wolverkrans Mines in Mpumalanga Province. In 2013, BESCA produced 30.2 Mt of coal compared with 32.6 Mt in 2012. The remaining life of the Middelburg Mine was estimated to be 24 years; Wolverkrans, 22 years; and Khutala and Klipspruit, 7 years each (BHP Billiton Ltd., 2013a, p. 37; 2013b, p. 4; 2014, p. 23).

Glencore Xstrata operated the Goedgevonden Complex, the Tweefontein Complex, and the iMpunzi Complex, which had capacities of 8 Mt/yr, 7 Mt/yr, and 6.3 Mt/yr, respectively. In late 2013, Glencore Xstrata had completed 58% of the construction on an expansion of the Tweefontein Complex's capacity to 14 Mt/yr of salable coal from 7 Mt/yr; the project was likely to be completed in 2015 (Glencore Xstrata plc, 2013, p. 9, 11–12, 16–17).

Optimum Coal Holdings (Pty) Ltd. (Glencore Xstrata, 67.6%) operated the Optimum Complex and the Koornfontein Complex, which had capacities of 11 Mt/yr and 2.8 Mt/yr of salable coal, respectively. The company was considering the possibility of starting mines at the Koornfontein OC and the Schoonoord projects. The Koornfontein OC project could produce 3.3 Mt/yr of run-of-mine coal starting in 2019, and the Schoonoord project,

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1.6 Mt/yr of run-of-mine coal starting in 2020 (Glencore Xstrata plc, 2013, p. 10, 15–16).

Shanduka Coal (Pty) Ltd. (Shanduka Group, 50.01%, and Glencore Xstrata, 49.99%) operated the Middelburg Complex, which had a capacity of 6.5 Mt/yr of salable coal. The company was engaged in a feasibility study on a new mine at the Argent project. Depending on the results of the study, Argent could start production in the second quarter of 2015 and ramp up to its full capacity of 1.5 Mt/yr of salable thermal coal by the end of 2015. Shanduka Coal was also considering a new mine at the Springboklaagte project, which could produce 2.4 Mt/yr of run-of-mine coal starting in 2019 (Glencore Xstrata plc, 2013, p. 13, 16, 19).

Umcebo Mining Ltd. (Glencore Xstrata, 43.66%) operated the Kleinfontein, the Klippan, and the Middelkraal Mines, which had a total capacity of 7 Mt/yr of salable coal. The company planned to start processing coal from the new Wonderfontein Mine in the second quarter of 2014 and to ramp up to the mine's full capacity of 2.5 Mt/yr by the end of 2014. The life of the Wonderfontein Mine was estimated to be 14 years, and the Kleinfontein, the Klippan, and the Middelkraal Mines, 3 years (Glencore Xtrata plc, 2013, p. 14, 16).

Total Coal South Africa (Pty) Ltd.'s (TCSA) operated the Dorstfontein West, the Dorstfontein East, the Forzando North, the Forzando South, and the Tumelo Mines. In 2013, sales from TCSA's mines were 4.26 Mt compared with 4.04 Mt in 2012 (Chamber of Mines of South Africa, 2013, p. 20; 2015, p. 22).

Kangra Group (Pty) Ltd. [Shanduka Resources (Pty) Ltd., 30%] produced about 3 Mt/yr of salable coal from the Savmore Mine, which had an estimated remaining life of between 3 and 5 years. The company was considering the development of the Kusipongo project to extend Savmore's life by between 10 and 20 years. Kusipongo could produce between 3.6 and 3.8 Mt/yr of run-of-mine coal; construction was planned to start in 2014 (Environmental Resources Management Southern Africa (Pty) Ltd., 2013, p. 1.1, 3.8–3.9).

Keaton Energy Holdings Ltd. was producing salable coal at the Vaalkranz and the Vanggatfontein Mines at the rate of 2.5 Mt/yr in 2013, most of which was produced at Vanggatfontein. The company planned to increase output to about 5 Mt/yr by 2017 by developing the Braakfontein project, which was expected to produce 1.1 Mt/yr, and by acquiring Xceed Resources Ltd. of Australia (Keaton Energy Holdings Ltd., 2013, p. 15; Kotze, 2013).

Keaton planned to complete the acquisition of Xceed, which held the Moabsvelden thermal coal project, in February 2014. Depending on the results of a feasibility study, Keaton could start mining at Moabsvelden in the first quarter of 2015. Production was likely to be about 1.4 Mt/yr at full capacity (Kotze, 2013).

In 2013, Continental Coal Ltd.'s sales from the Vlakvarkfontein Mine were about 1.38 Mt, and from the Ferreira and the Penumbra Mines, about 565,000 t. Continental planned to produce at Penumbra's full capacity of 760,000 t/yr of run-of-mine coal by late November. The company also planned to start mining at the new De Wittekrans Mine by late 2014. Production at De Wittekrans was expected to be 800,000 t/yr of run-of-mine coal in the first phase before increasing to 3.6 Mt/yr (Moodley, 2013; Chamber of Mines of South Africa, 2015, p. 22).

Wescoal Holdings Ltd. operated the Khanyisa Mine, which was expected to be depleted by mid-2015. The company also started mining at the new Intibane Mine in June 2013; total production at Intibane and Khanyisa was 1.31 Mt in fiscal year 2013. By 2014, Wescoal planned to start production at the new Elandspruit Mine. Wescoal planned to supply a total of 3.2 Mt/yr of coal from its operations (Sidler, 2013).

In 2013, sales from Coal of Africa Ltd.'s Woestalleen Complex were about 901,000 t, the Mooiplaats Mine, 327,000 t; and the Vele Mine, 62,000 t. Mooiplaats and Woestalleen were placed on care-and-maintenance status in 2013. Output at the Vele Mine decreased sharply in the fourth quarter of 2013 as Coal of Africa focused on the construction of a new processing plant. The company planned to start production at the new plant at Vele in mid-2015 and to produce 1.1 Mt/yr of salable coal (Tex Report, The, 2014a; Chamber of Mines of South Africa, 2015, p. 22).

Coal of Africa also planned to start construction of the Makhado project at the Southpansberg coalfield in Limpopo Province in 2014; production was expected to start in mid-2016. The company planned to produce 3.2 Mt/yr of thermal coal and 2.6 Mt/yr of coking coal during the estimated 16-year life of the mine (Cornish, 2013b).

Universal Coal plc of the United Kingdom was engaged in the construction of its new Kangala Mine in 2013. The mine was likely to be commissioned in February 2014; Universal planned to supply 2 Mt/yr of coal to Eskom and 100,000 t/yr to the export market. The estimated life of the first pit at Kangala was 8 years; the company was also considering a second contiguous pit with an estimated 8-year life. Universal also planned to develop the Roodekop project, which would produce 1 Mt/yr of run-of-mine thermal coal. The development of Roodekop depended on a water use license that was expected to be granted in the first half of 2014 (Cornish, 2013f).

Resource Generation Ltd. (Resgen) of Australia planned to start production at its new Boikarabelo Mine in 2015. In the first stage of the project, production was likely to be 6 Mt/yr of thermal coal, of which about 3 Mt/yr would be consumed domestically and 3 Mt/yr would be exported (Tex Report, The, 2013).

Petroleum.—South Africa had four petroleum refineries with a combined capacity of about 485,000 barrels per day (bbl/d). PetroSA, which was a Government-owned company, planned to build a new refinery at Coega with a capacity of 400,000 bbl/d. As of September 2013, it was unclear when the refinery would be completed (Quinlan, 2013).

Uranium.—AngloGold Ashanti mined uranium as a coproduct with gold. From 2003 to 2013, national uranium production decreased by 32% because of decreased gold production. In 2013, AngloGold Ashanti's production of uranium oxide (U_3O_8) from its Vaal River and surface mining operations was 626 t compared with 549 t in 2012. With the purchase of First Uranium's Mine Waste Solutions (MWS) operations, AngloGold Ashanti acquired resources of 352 Mt at a grade of 0.008% U_3O_8. The company planned to complete the uranium circuit at the MWS processing plant in 2014, which would allow its total production to increase to between 1,400 and 2,000 t/yr of U_3O_8. The estimated life of the MWS

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operations was more than 30 years (table 1; AngloGold Ashanti Ltd., 2012, 2014, p. 37; Chamber of Mines of South Africa, 2013, p. 39).

From 2014 to 2018, Sibanye planned to produce a total of about 230 t/yr of U_3O_8 from the Cooke Underground and the Randfontein Surface operations. At the end of 2013, Gold One and Sibanye were engaged in a feasibility study on producing uranium from the West Rand Tailings Retreatment project. Depending on the results of the study, the companies could produce nearly 1,600 t/yr of U_3O_8 from retreating tailings. Full capacity would be reached during a 3- to 5-year period (Cornish, 2013g; Sibanye Gold Ltd., 2014, p. 74).

DRDGold was considering the possibility of producing nearly 140 t/yr of U_3O_8 at the Ergo tailings retreatment operations. Harmony was also considering uranium production from its gold operatons (Mining Review Africa, 2013).

Reserves and Resources

South Africa's estimated share of world reserves of PGMs amounted to 95%; chromite, 42%; manganese, 26%; vanadium, 23%; rutile and zirconium, 18% each; fluorspar, 17%; gold, 11%; ilmenite, 9%; and nickel, 5%. The country also had substantial reserves of andalusite, antimony, coal, copper, iron ore, lead, phosphate rock, uranium, vermiculite, and zinc (table 3; Bedinger, 2015a, b; Corathers, 2015a; George, 2015; Kuck, 2015; Loferski, 2015; McRae, 2015; Papp, 2015; Polyak, 2015).

Outlook

Numerous producers are planning new mines and plants and capacity expansions of existing operations for andalusite, antimony, cement, chromite, coal, diamond, ferrochromium, ferromanganese, ferrovanadium, fluorspar, gold, iron ore, manganese ore, pig iron, PGMs, phosphate fertilizers, rare-earth elements, silicomanganese, titanium metal, uranium, vanadium, zinc, and zirconium metal. Power shortages could constrain mining and mineral processing expansions until Eskom's new coal-fired Kusile and Medupi power stations are commissioned, particularly in power-intensive industries, such as ferrochromium.

Eskom planned to start operations at Medupi in the second half of 2014, and at Kusile by the end of 2014. Initial capacity at Kusile and Medupi would be 800 megawatts (MW) and 794 MW, respectively. Eskom planned to increase capacity in increments to 4,800 MW at Kusile and 4,764 MW at Medupi by 2018 (Mail & Guardian, 2013).

Increases in coal, iron ore, and manganese exports depend upon increased rail network capacity. Transnet planned to spend about $37 billion on expanding its railways between 2012 and 2019. The railway capacity dedicated to coal exports was expected to increase in increments to 98 Mt/yr in mid-2019 from 68 Mt/yr in 2012. During the same period, Transnet planned to increase the capacity of the iron ore railways to 83 Mt/yr from 53 Mt/yr, and railways for transporting manganese ore, to 12 Mt/yr from 5.5 Mt/yr (Mining Journal, 2013a; Barradas, 2014).

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TABLE 1
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2009	2010	2011	2012	2013
METALS						
Aluminum metal, primary		809,000	807,000	809,000	665,000	822,000
Antimony concentrate, Sb content		2,673	3,239	3,175	3,066 r	2,400 e
Chromium, gross weight:						
44% to 48% chromic oxide	thousand metric tons	1,296	808	1,070	1,073	1,608
Less than 44% chromic oxide	do.	6,265	10,063	10,795	10,244 r	12,037
Total	do.	7,561	10,871	11,865	11,317 r	13,645
Cobalt:						
Mine output, Co content[e]		610	1,800	1,600	2,500	2,800
Refinery output		238	840	862	1,102	1,294
Copper:						
Mine, Cu content		107,600	102,600	96,600	81,000	77,000
Metal:						
Smelter		86,900	75,900	82,400	62,300	77,500
Refined, primary		89,453	81,129	86,166	66,416	80,821
Gold:						
Mine	kilograms	197,628	188,702	180,293	155,286 r	159,724
Refined[2]	do.	389,596	385,244	476,229	440,000 e	440,000 e
Iron and steel:						
Ore and concentrate:						
Gross weight	thousand metric tons	55,313	58,709	58,057	67,100	71,543
Fe content (62% to 65%)	do.	34,800	36,900	36,500	42,000 e	42,500 e
Metal:						
Direct-reduced iron	do.	1,340	1,120	1,414	1,493	1,400
Pig iron	do.	4,444	5,429	4,604	4,599	4,900
Ferroalloys, electric arc furnace:						
Chromium ferroalloys	do.	2,346	3,607	3,426	3,063	3,219
Ferromanganese	do.	275 r	473 r	714 r	706 r	697
Ferrosilicon	do.	110	128	126 r	83 r	78 e
Ferrovanadium[e]	do.	14	19	19	18	18
Silicomanganese[3]	do.	135	274	314	149	134 [4]
Silicon metal	do.	39	46	59	53 r	32 e
Total[e]	do.	2,920 r	4,550 r	4,660 r	4,070 r	4,180
Steel:						
Crude	do.	7,484	7,617	7,546	6,938	7,200 e
Stainless		547	478	444 r	505 r	493
Lead:						
Concentrate, Pb content		49,149	50,625	54,460	52,489	41,848
Refined, secondary		58,000	51,000	56,000	54,000 r	54,000 e
Manganese:						
Ore and concentrate, gross weight:						
Metallurgical:						
More than 48% manganese	thousand metric tons	--	847	128	200	--
45% to 48% manganese	do.	2,121	1,683	2,742	2,711	3,057
40% to 45% manganese	do.	498	843	1,181	1,187	1,319
30% to 40% manganese	do.	1,949	3,783	4,584	4,833	6,581
Total	do.	4,568	7,156	8,636	8,931	10,957
Chemical, 35% to 65% manganese dioxide	do.	11	15	16	12	1
Grand total	do.	4,579	7,172	8,652	8,943	10,958
Metal, electrolytic[e]	do.	11	20	29 [4]	30 [4]	30 e
Nickel:						
Mine output, concentrate, Ni content		34,605	39,960	43,321	45,945	51,208
Metal, electrolytic		34,200	34,700	35,900	32,900	33,200
Platinum-group metals:						
Mine:						
Iridium	kilograms	6,378	6,445	6,813	5,665	5,680
Platinum	do.	140,819	147,790	148,008	128,590	137,024

See footnotes at end of table.

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TABLE 1—Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2009	2010	2011	2012	2013
METALS—Continued						
Platinum-group metals:—Continued						
Mine:—Continued						
Palladium	kilograms	75,117	82,222	82,731	74,738	76,008
Rhodium	do.	20,007	20,001	20,332	17,810	18,129
Ruthenium	do.	29,071	30,846	30,966	27,535	27,347
Total	do.	271,393	287,304	288,850	254,338	264,188
Refined:[5]						
Platinum	do.	149,500	156,600	155,900	141,700	144,700
Palladium	do.	86,610	94,990	89,640	84,800	82,300
Rhodium	do.	21,600	21,400	21,300	19,300	18,600
Other[1]	do.	34,600	37,600	36,400	32,400	32,100
Total	do.	292,300	310,600	303,200	278,200	277,700
Selenium, Se content of anode slimes[e]	do.	14,000	16,000	18,000	14,000	14,000
Silver, mine	do.	77,780	79,315	73,180	67,304	68,777
Tellurium, Te content of anode slimes[e]	do.	6,000	7,500	8,500	6,500	6,500
Titanium:						
Ilmenite concentrate[e]	thousand metric tons	2,000 r	2,100 r	2,300 r	2,200 r	2,100
Rutile concentrate	do.	136	130	149	150 e	67
Total[e]	do.	2,140 r	2,230 r	2,450 r	2,350 r	2,170
Titaniferous slag	do.	1,084	1,210 r	1,367 r	1,300 r,e	1,150
Vanadium, vanadium metal content		14,353	22,606	21,652	19,957	21,397
Zinc:						
Concentrate, Zn content		28,159	36,142	36,629	37,034	30,145
Metal, smelter, primary		87,000	90,000	73,000	--	--
Zirconium concentrate (baddeleyite and zircon)		372,000	383,000 r	427,000 r	400,000 r,e	210,000 e
INDUSTRIAL MINERALS						
Andalusite		165,217	189,185	186,242	163,801 r	180,000 e
Cementitious products:						
Cement, finished product, sales	thousand metric tons	11,784	10,870	11,234	11,560	12,200
Granulated slag, fly ash, and others, sales[e]	do.	1,200	1,100	1,200	1,200	1,300
Total[e]	do.	13,000	12,000	12,400	12,800	13,500
Clays:						
Attapulgite		54,418	85,336	14,448	15,019 r	21,233
Bentonite		40,340	54,311	120,417	120,592 r	177,187
Brick clay, local sales	thousand metric tons	8,763	6,923	7,658	7,227 r	6,897
Fire clay		120,162	551,612	785,641	643,285	506,019
Flint clay, raw and calcined		37,227	39,690	29,968	21,065	22,984
Kaolin		31,048	29,929	15,220	20,791 r	22,295
Diamond, natural:						
Gem[e]	thousand carats	2,500	3,600	2,800	2,900	3,300
Industrial[e]	do.	3,600	5,300 r	4,300	4,400 r	4,900
Total	do.	6,113	8,868	7,112	7,250 r	8,168
Feldspar		101,394	94,307	101,559	94,458	191,443
Fluorspar:						
Acid-grade[e]		196,000	150,000	225,000	210,000	165,000
Metallurgical-grade[e]		8,000	10,000	15,000	15,000	10,000
Total		204,000	160,000	240,000	225,000 e	175,000 e
Gypsum, crude		597,571	513,310	476,118	558,242	559,443
Industrial or glass sand (silica)	thousand metric tons	2,306	2,905	2,722	2,155 r	2,198
Lime	do.	1,368	1,291	1,539	1,209	1,187
Magnesite, crude		47,600	27,700	31,900	31,000 e	31,000 e
Mica, scrap and ground		572	904	633	400	309
Nitrogen, N content of ammonia[e]		510,000	470,000	470,000	550,000 r	600,000

See footnotes at end of table.

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TABLE 1—Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2009	2010	2011	2012	2013
INDUSTRIAL MINERALS—Continued						
Phosphate rock:						
Gross weight	thousand metric tons	2,237	2,494	2,565	2,242	2,132
Phosphorus pentoxide content	do.	839	935	962	841	800
Pigments, mineral, natural:						
Ochers		--	--	--	--	-- e
Oxides		183	244	266	--	-- e
Total		183	244	266	--	-- e
Salt		408,422	394,493	381,177	399,135	479,024
Sodium sulfate, natural		43,835	37,369	38,290	36,435	41,428
Stone, n.e.s.:[6]						
Dimension:						
Granite and norite		334,589	272,531	227,154	187,475	236,229
Slate		25,841	48,114	53,643	23,938	19,266
Crushed and broken:						
Limestone and dolomite	thousand metric tons	18,568	17,927	16,980	17,269	17,188
Shale:						
For cement	do.	462	388	404	423 r	464
Other	do.	975	570	655	547 r	837
Total	do.	1,437	958	1,059	970 r	1,301
Aggregate and sand, n.e.s.[6]	do.	53,604	52,356	52,286	54,649 r	61,414
Sulfur:						
S content of pyrite	do.	60	30	--	--	-- e
Byproduct:						
Metallurgy	do.	185	141	174	103 r	110 e
Petroleum	do.	291	205	163	154 r	160 e
Total	do.	536	376	337 r	257	270 e
Talc and related materials:						
Talc		4,718	3,150	4,453	4,765	4,924
Pyrophyllite (wonderstone)		114,889	122,511	121,368	18,734	17,336
Vermiculite		193,334	199,285	170,571	132,886	127,658
Wollastonite		--	--	2,400 e	2,400 e	2,400 e
MINERAL FUELS AND RELATED MATERIALS						
Coal (salable product):						
Anthracite	thousand metric tons	1,658	2,074	2,554	3,005	3,621
Bituminous	do.	248,880 r	252,448	248,153	256,007 r	252,661
Total	do.	250,538	254,522	250,707	259,012 r	256,282
Natural gas	million cubic meters	1,368	1,718	1,516	1,313	927
Petroleum:[7]						
Crude	thousand 42-gallon barrels	1,070	1,358	591	343	139
Refinery products:						
Liquefied petroleum gases	do.	2,726	3,086	3,666	3,422 r	3,400 e
Natural gas liquids	do.	1,529	1,456	1,456	1,019 r	1,000 e
Gasoline	do.	48,766	49,773	53,236	53,295 r	53,000 e
Jet fuel	do.	11,681	10,951	12,410	9,445 r	9,400 e
Kerosene	do.	3,092	2,644	2,806	2,729 r	2,700 e
Distillate fuel oil	do.	40,329	50,265	56,450	57,494 r	58,000 e
Residual fuel oil	do.	14,525	15,205	14,399	19,021 r	19,000 e
Other, includes lubricants and greases[e]	do.	14,500	16,000 r	17,000 r	17,000 r	17,000
Total[e, 8]	do.	137,000	149,000 r	161,000 r	163,000	164,000
Uranium, U_3O_8 content		629	682	656	551	626

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. -- Zero.
[1]Table includes data available through February 27, 2015.
[2]Data are for the Rand Refinery (Pty) Ltd. fiscal year ending September 30 of the year listed.
[3]Reported by the International Manganese Institute.
[4]Reported figure.

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TABLE 1—Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES[1]

[5]May include small amounts of gold.
[6]Not elsewhere specified.
[7]In addition, Sasol Ltd. produced about 67 million barrels per year of synthetic liquid petroleum fuels from coal.
[8]Excludes refinery fuel and losses.
Source: Mineral Economics Directorate, South Africa Department of Minerals and Energy.

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TABLE 2
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum		BHP Billiton Ltd.	Hillside smelter at Richards Bay	726.
Do.		do.	Bayside smelter at Richards Bay	97.
Andalusite		Imerys South Africa (Pty) Ltd. (subsidiary of Imerys Group)	Annesley and Havercroft Mines at Penge, Krugerspost Mine near Lydenburg, and Thabazimbi Mine near Thabazimbi	225.
Do.		Andalusite Resources (Pty) Ltd. [African Mineral Trading and Exploration (Pty) Ltd.]	Maroeloesfontein, near Thabazimbi, Northern Province	70.
Antimony	metric tons	Consolidated Murchison Ltd. (Village Main Reef Ltd., 74%)	Cons Murch Mine near Gravelotte	7,000 antimony in concentrate.
Cement		Pretoria Portland Cement Co. (Pty) Ltd. (Barloworld Trust Co. Ltd., 68%)	De Hoek, Dwaalboom, Hercules, Jupiter, Riebeeck, and Slurry plants	8,000.
Do.		AfriSam Consortium (Pty) Ltd.	Dudfield, Roodepoort, and Ulco plants	4,600.
Do.		Lafarge South Africa Ltd. (Lafarge S.A.)	Lichtenburg plant in North West Province	3,600.
Do.		Natal Portland Cement Co. (Pty) Ltd. (Cimentos de Portugal SGPS, S.A., 98%)	Simumu plant	1,700.
Chromite		Glencore Xstrata plc, 79.5%, and Merafe Resources Ltd., 20.5%	Thorncliffe Mine at Steelpoort	995.
Do.		do.	Kroondal Mine at Rustenburg	850.
Do.		do.	Helena Mine at Steelpoort	825.
Do.		do.	Waterval Mine	650.
Do.		do.	Horizon Mine at Pilansberg	260.
Do.		Samancor Chrome Ltd. (International Mineral Resources BV, 70%)	Eastern Chrome Mines in Steelpoort Valley, Mpumalanga Province	2,000.
Do.		do.	Western Chrome Mines in Northern Province	1,500.
Do.		Tharisa Minerals (Pty) Ltd.	Tharisa Mine	1,920.
Do.		Hernic Ferrochrome (Pty) Ltd. (Mitsubishi Corp., 51%)	Bokone Mines	1,500.
Do.		Assmang (Pty) Ltd. (African Rainbow Minerals Ltd., 50%, and Assore Ltd., 50%)	Dwarsrivier Mine in Mpumalanga Province	1,400.
Do.		International Ferro Metals Ltd.	Lesedi Mines[1]	1,320.
Do.		do.	Sky Chrome Mine	840 run-of-mine.
Do.		Lonmin plc	Marikana Mines (Eastern Platinum, Karee, and Western Platinum) and Pandora Mine	1,500.[e]
Do.		Nkomati Joint Venture (African Rainbow Minerals Ltd., 50%, and MMC Norilsk Nickel, 50%)	Nkomati Chrome Mine in Mpumalanga Province	1,000.
Do.		Dilokong Chrome Mine (Pty) Ltd. [ASA Metals (Pty) Ltd., 100%]	Dilokong Mine, near Burgersfort in Mpumalanga Province	800.
Do.		Eastern Platinum Ltd. (Eastplats)	Crocodile River Mine at Arbourfell[1]	520.[e]
Do.		Bayer (Pty) Ltd.	Rustenburg Chrome Mine	450.
Do.		Anglo American Platinum Ltd. (Anglo American plc, 74.1%) (Amplats)	Bathopele, Dishaba, Khomanani, Khuseleka, Mogalakwena, Siphumelele, Thembelani, Union, and other mines	430.[e]
Do.		Afarak Group Oyj	Mecklenburg Mine	300 run-of-mine.
Coal		Anglo Coal Ltd. (Anglo American plc, 100%)	New Vaal Mine	18,000.
Do.		Anglo Coal Ltd., 73%	Kriel Mine	10,000.
Do.		do.	Zibulo Mine	8,000.
Do.		Anglo Coal Ltd.	Goedehoop Mine	7,500.
Do.		do.	Isibonelo Mine	5,000.
Do.		do.	New Denmark Mine	5,000.
Do.		do.	Kleinkopje Mine	4,500.
Do.		do.	Landau Mine	4,200.
Do.		do.	Greenside Mine	3,100.
Do.		Exxaro Resources Ltd. (BEE Holdco, 52.3%)	Grootegeluk Mine in Limpopo Province	18,800
Do.		do.	Matla Mine in Mpumalanga Province	14,000.

See footnotes at end of table.

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TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Coal—Continued	Exxaro Resources Ltd. (BEE Holdco, 52.3%)	Arnot Mine in Mpumalanga Province	5,000.
Do.	do.	Leeuwpan Mine in Mpumalanga Province	3,800.[e]
Do.	do.	North Block Mine in Mpumalanga Province	3,300.
Do.	do.	New Clydesdale Mine in Mpumalanga Province	1,400.
Do.	do.	Tshikondeni Mine in Limpopo Province	350.[e]
Do.	Exxaro Resources Ltd., 50%, and Anglo American plc, 50%	Mafube Mine North Block Mine in Mpumalanga Province	4,200.
Do.	Sasol Ltd.	Syferfontein Mine	9,600.
Do.	do.	Middelbult Mine	8,300.
Do.	do.	Bosjesspruit Mine	7,500.
Do.	do.	Brandspruit Mine	6,600.
Do.	do.	Twistdraai Mine	6,100.
Do.	do.	Sigma Mine	2,200.
Do.	BHP Billiton Energy Coal South Africa Ltd.	Middelburg and Wolverkrans Mines	41,400.
Do.	do.	Khutala underground mine	19,500.
Do.	do.	Klipspruit Mine	16,000.
Do.	Glencore Xstrata plc, 74%	Goedgevonden Complex at Witbank	8,000.
Do.	Glencore Xstrata plc, 79.8%	Tweefontein Complex at Witbank	7,000.
Do.	do.	Impunzi Complex at Witbank	6,300.
Do.	Optimum Coal Holdings (Pty) Ltd. (Glencore Xstrata plc, 67.6%)	Optimum Complex	11,000.
Do.	do.	Koornfontein Complex	2,800.
Do.	Umcebo Mining Ltd. (Glencore Xstrata plc, 43.66%)	Kleinfontein, Klippan, and Middelkraal Mines	7,000.
Do.	do.	Wonderfontein Mine	2,500.
Do.	Shanduka Coal (Pty) Ltd. (Shanduka Resources (Pty) Ltd., 50.01%, and Glencore Xstrata plc, 49.99%)	Middelburg Complex	6,500.
Do.	Coal of Africa Ltd.	Woestalleen Complex[1]	2,500.
Do.	do.	Mooiplaats Mine[1]	2,000.
Do.	do.	Vele Mine	1,000.
Do.	Total Coal SA (Pty) Ltd.	Dorstfontein West and Dorstfontein East Mines	2,100.[e]
Do.	do.	Forzando North and Forzando South Mines	1,600.[e]
Do.	do.	Tumelo Mine	450.[e]
Do.	Kangra Group Pty. Ltd. (Shanduka Resources (Pty) Ltd., 30%)	Savmore Mine	3,000.
Do.	Keaton Energy Holdings Ltd.	Vanggatfontein Mine	2,640.
Do.	do.	Vaalkranz Mine	360.
Do.	Imbawula Group	Mpumalanga Division (Spitzkop and Tselentis Mines) at Breyten and Ermelo	2,800.
Do.	Continental Coal Ltd.	Vlakvarkfontein Mines	1,400.[e]
Do.	do.	Ferreira Mine	500.[e]
Do.	do.	Penumbra Mine	500.
Do.	Kuyasa Mining (Pty) Ltd.	Delmas Mine	2,000.
Do.	Wescoal Holdings Ltd.	Khanyisa Mine	1,000
Do.	do.	Intibane Mine	1,000
Copper:			
Mine	Palabora Mining Co. Ltd.	Palabora Mines at Phalaborwa	65.[2]
Do.	Anglo American Platinum Ltd. (Amplats) (Anglo American plc, 78%)	Bathopele, Dishaba, Khomanani, Khuseleka, Mogalakwena, Siphumelele, Thembelani, Union, and other mines	65.[2]
Do.	Nkomati Joint Venture	Nkomati Mine in Mpumalanga Province	10.
Do.	Impala Platinum Ltd. (Implats)	Impala Mines	7.[2]

See footnotes at end of table.

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TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper:—Continued				
Mine—Continued		Black Mountain Mineral Development Co. (Pty) Ltd. (Vedanta Resources plc, 74%)	Black Mountain Mine near Aggeneys in Northern Cape Province	6.[2]
Smelter		Palabora Mining Co. Ltd.	Smelter at Phalaborwa	110.[2]
Do.		Anglo American Platinum Ltd. (Amplats)	Rustenburg Smelter	11.[2]
Do.		Impala Platinum Ltd. (Implats)	Smelter near Phokeng	7.[2]
Refined		Palabora Mining Co. Ltd.	Refinery at Phalaborwa	140.[2]
Do.		Anglo American Platinum Ltd. (Amplats)	Rustenburg Base Metal Refiners	13.[2]
Do.		Lonmin plc	Base Metals refinery and scrap plant	9.[2]
Do.		Impala Platinum Ltd. (Implats)	Base Metals refinery	7.[2]
Diamond	thousand carats	De Beers Consolidated Mines Ltd. (Anglo American plc, 85%)	Venetia Mine in Northern Province	7,500.
Do.	do.	do.	Kimberley surface mines, Kimberley	1,500.
Do.	do.	do.	Voorspoed Mine	800.
Do.	do.	Petra Diamonds Ltd.	Finsch Mine, 100 kilometers west of Kimberley	1,800.[e]
Do.	do.	do.	Cullinan Mine	950.[e]
Do.	do.	do.	Helam, Sedibeng, and Star Mines[1]	175.
Do.	do.	do.	Kimberley underground mines, Kimberley	130.[e]
Do.	do.	do.	Koffiefontein Mine in Free State Province	50.[e]
Do.	do.	Diamcor Mining Inc.	Krone-Endorda Mine	120.
Fluorspar		Vergenoeg Mining Corp. (Pty) Ltd. [Minerales Y Productos Derivados SA, 85%]	Vergenoeg Mine at Rust de Winter	250.
Do.		Witkop Fluorspar Mine (Pty) Ltd. (subsidiary of Sallies Ltd.)	Witkop Mine at Zeerust[1]	140.
Gold:				
Mine		AngloGold Ashanti Ltd. (Anglo American plc, 41.8%)	Vaal River operations:	
Do.	kilograms	do.	Kopanang Mine	32,100 gold.
Do.	do.	do.	Great Noligwa Mine	14,600 gold.
Do.	do.	do.	Moab Khotsong Mine	11,000 gold.
Do.	do.	do.	Surface operations	5,100 gold.[e]
Do.	do.	do.	West Wits operations:	
Do.	do.	do.	Mponeng Mine	17,000 gold.
Do.	do.	do.	Tau Tona Mine	16,000 gold.
Do.	do.	do.	Savuka Mine	12,000 gold.
Do.	do.	do.	Mine Waste Solutions Project (MWS)	3,400 gold.
Do.	do.	Sibanye Gold Ltd.	Driefontein and Kloof Mines	36,900 gold.
Do.	do.	do.	Beatrix Mine	12,800 gold.
Do.	do.	Harmony Gold Mining Co. Ltd.	Kusasalethu Mine	8,900 gold.
Do.	do.	do.	Doornkop Mine	6,100 gold.
Do.	do.	do.	Tshepong Mine	6,000 gold.
Do.	do.	do.	Phakisa Mine	5,900 gold.
Do.	do.	do.	Target 1 and Target 3 Mines	5,800 gold.[e]
Do.	do.	do.	Masimong Mine	4,400 gold.
Do.	do.	do.	Bambanani Mine	3,600 gold.
Do.	do.	do.	Surface operations	3,500 gold.[e]
Do.	do.	do.	Joel Mine	3,000 gold.[e]
Do.	do.	do.	Unisel Mine	2,100 gold.
Do.	do.	do.	Kalgold Mine	1,200 gold.
Do.	do.	Gold One International Ltd.	Modder East Mine	4,700 gold.
Do.	do.	do.	Cooke Underground Mine	4,200 gold.[e]
Do.	do.	do.	Randfontein Surface Mine	1,200 gold.[e]
Do.	do.	Gold Fields Ltd.	South Deep Mine	9,200 gold.

See footnotes at end of table.

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TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold:—Continued				
Mine—Continued	kilograms	Great Basin Gold Ltd.	Burnstone Mine[1]	7,900 gold.
Do.	do.	Village Main Reef Ltd.	Buffelsfontein and Tau Lekoa Mines	5,100 gold.[e]
Do.	do.	do.	Blyvoor Mine	2,300 gold.[e]
Do.	do.	Pan African Resources plc	Barberton Mine	3,600 gold.
Do.	do.	do.	Evander Mine	3,100 gold.[e]
Do.	do.	DRDGold Ltd.	East Rand Proprietary Mine	4,500 gold.[e]
Refined	metric tons	Rand Refinery Ltd. (AngloGold Ashanti Ltd., 53%, and Gold Fields Ltd., 33%)	Germiston, Gauteng Province	1,000.
Iron and steel:				
Iron ore		Kumba Iron Ore Ltd.	Sishen Mine at Sishen	37,000.
Do.		do.	Kolomela Mine	10,000.
Do.		do.	Thabazimbi Mine at Thabazimbi	2,700.
Do.		Assmang (Pty) Ltd.	Khumani Mine	16,000.
Do.		do.	Beeshoek Mine near Postmasburg	4,000.
Do.		Palabora Mining Co. Ltd.	Palabora Mines at Phalaborwa	6,000.
Do.		Highveld Steel and Vanadium Corp. Ltd. (Ervaz Group S.A., 79%)	Mapochs Mine at Roossenekal	2,700.
Do.		Vametco Minerals Corp. (Ervaz Group S.A., 81%)	Vametco Vanadium Mine and plant near Brits	1,100
Do.		Glencore Xstrata plc	Rhovan Mine at Brits	400.
Ferroalloys		Glencore Xstrata plc, 79.5%, and Merafe Resources Ltd., 20.5%	Lion plant at Steelpoort	720 ferrochromium.
Do.		do.	Wonderkop plant at Marikana	553 ferrochromium.
Do.		do.	Rustenburg plant at Rustenburg	430 ferrochromium.
Do.		Glencore Xstrata plc, 69.6%, and Merafe Resources Ltd., 30.4%	Lydenburg plant at Lydenburg	396 ferrochromium.
Do.		Glencore Xstrata plc, 79.5%, and Merafe Resources Ltd., 20.5%	Boshoek plant at Boshoek	240 ferrochromium.
Do.		Samancor Chrome Ltd.	Plants at Middelburg, Steelpoort, and Witbank	1,110 ferrochromium.
Do.		Hernic Ferrochrome (Pty) Ltd.	Plant at Brits	420 ferrochromium.
Do.		ASA Metals (Pty) Ltd. (Sinosteel, 60%, and Limpopo Economic Development Enterprise, 40%)	Plant near Pietersburg, Northern Province	400 ferrochromium.
Do.		International Ferro Metals Ltd.	Plant in North West Province	267 ferrochromium.
Do.		Tata Steel (KZN) (Pty) Ltd.	Richards Bay	150 ferrochromium.
Do.		Assmang (Pty) Ltd.	Cato Ridge plant in KwaZulu Natal Province	300 ferromanganese.
Do.		do.	Machadodorp plant in Mpumalanga Province	290 ferromanganese
Do.		Samancor Manganese (Pty) Ltd. (BHP Billiton Ltd., 44.4%, and Anglo American plc, 29.6%)	Plant at Meyerton	500 ferromanganese.
Do.		Renova Group	Plant at Witbank	50 ferromanganese;[1] 180 silicomanganese.
Do.		Globe Speciality Metals Inc.	Plant at Ballengeich	45 ferrosilicon.
Do.		Grupo Ferroatlantica	Rand Carbide plant	35[e] ferrosilicon.
Do.	metric tons	Vanchem Vanadium Products (Pty) Ltd.	Plant at Witbank	12,500 ferrovanadium.
Do.	do.	Glencore Xstrata plc	Rhovan plant at Brits	6,000 ferrovanadium.
Do.	do.	Vametco Minerals Corp.	Smelter near Brits	4,800 ferrovanadium.
Do.		Afarak Group Oyj	Mogale plant	110 ferroalloys.
Steel		ArcelorMittal South Africa Ltd.	Vanderbijlpark plant	4,400 crude steel.
Do.		do.	Newcastle and Vereeniging plants	2,200 crude steel.
Do.		do.	Saldanha plant	1,200 crude steel.

See footnotes at end of table.

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TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Iron and steel:—Continued			
Steel—Continued	Evraz Highveld Steel and Vanadium Ltd.	Witbank	1,000 iron; 1,000 crude steel.
Do.	Columbus Stainless (Pty) Ltd. (Acerinox SA, 76%)	Stainless steel plant at Middelburg	750 crude steel.
Do.	Scaw Metals Group	Germiston plant, Johannesburg	600 crude steel.
Do.	Davsteel Division (Cape Gate Pty. Ltd.)	Vanderbijlpark plant, Gauteng	485 crude steel; 460 rolled steel.
Do.	Cape Town Iron & Steel Works (Pty) Ltd. (Cisco)	Kuilsrivier plant, Cape Town	300 crude steel; 300 billet.
Do.	Duferco Steel Processing Ltd.	Cold-rolled slab steel plant at Saldanha Bay	240 rolled steel.
Lead	Vedanta Resources plc	Black Mountain Mine near Aggeneys in Northern Cape Province	55 lead in concentrate.
Lime	PPC Lime Ltd. (subsidiary of Pretoria Portland Cement Company Ltd.)	Plant at Lime Acres	1,200.
Do.	Idwala Lime (Idwala Industrial Holdings)	Plant at Daniëlskuil	1,000.
Do.	Inca Lime (Pty) Ltd. (subsidiary of Inca Mining (Pty) Ltd.)	Plant at Immerpan, Limpopo Province	100.
Manganese	Hotazel Manganese Mines (Pty) Ltd. (BHP Billiton, 44.4% and Anglo American plc, 29.6%)	Mamatwan Mine near Hotazel	3,500 ore.
Do.	do.	Wessels Mine near Hotazel	1,000 ore.
Do.	United Manganese of Kalahari (Pty) Ltd. (UMK) (Majestic Silver Trading 40 (Pty) Ltd., 51%, and Renova Group of Russia, 49%)	Kalahari Mine	4,000 ore.
Do.	Assmang (Pty) Ltd.	Nchwaning Mine near Black Rock	3,000 ore.
Do.	do.	Gloria Mine near Black Rock	600 ore.
Do.	Asia Minerals Ltd. (AML)	Kudumane Mine	3,000 ore.
Do.	Tshipi e Ntle Manganese Mining (Pty) Ltd. (Ntsimbitntle Mining (Pty) Ltd., 50.1%, and Jupiter Mines Ltd., 49.9%)	Tshipi Borwa Mine	2,400 ore.
Do.	Metmin (Metorex Pty. Ltd., 100%)	Open pit mine in North West Province	24 manganese dioxide.
Do.	Manganese Metal Co. Pty. Ltd. [Samancor Manganese (Pty) Ltd., 51%]	Electrolytic plant at Nelspruit	30 manganese metal.
Nickel	Anglo American Platinum Ltd. (Amplats)	Bathopele, Dishaba, Khomanani, Khuseleka, Mogalakwena, Siphumelele, Thembelani, Union, and other mines	33 mine.[e]
Do.	do.	Rustenburg Base Metal Refiners	33 refined.
Do.	Nkomati Joint Venture	Nkomati Mine in Mpumalanga Province	21 mine.
Do.	Impala Platinum Ltd.	Impala Mines	6 mine.[e]
Do.	do.	Base Metals refinery	16 refined.[e]
Do.	Lonmin plc	Marikana and Pandora Mines	4 mine.[e]
Do.	do.	Base Metals refinery	5 sulfate.[e]
Nitrogen, ammonia	Sasol Ltd.	Plants at Sasolburg and Secunda	660.
Petroleum:			
Crude thousand 42-gallon barrels	Petroleum Oil and Gas Corporation of South Africa	Oribi and Oryx fields	730.
Refined do.	South African Petroleum Refineries (Shell SA Energy, 50%, and BP Southern Africa, 50%)	Sapref refinery in Durban	61,700.
Do. do.	Engen Ltd. (62%)	Engen refinery in Durban	43,100.
Do. do.	Caltex Oil SA (Pty) Ltd.	Chevref refinery in Cape Town	40,200.
Do. do.	National Petroleum Refiners of South Africa Pty. Ltd. (Sasol Ltd., 63.6%)	Natref refinery in Sasolburg	32,000.
Phosphate rock	Phosphate Development Corp. Ltd. [Foskor (Pty) Ltd.]	Foskor Mine and plant at Phalaborwa	2,800 phosphate rock.

See footnotes at end of table.

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TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Phosphoric acid		Farmers World Limpopo (Pty) Ltd.	Plant at Phalaborwa	325.
Platinum-group metals	kilograms	Anglo American Platinum Ltd.	Bathopele, Khomanani, Khuseleka, Siphumelele and Thembelani Mines	24,000 platinum; 11,900 palladium; 3,100 rhodium; 5,500 iridium and ruthenium.
Do.	do.	do.	Dishaba and Tumela Mines at Northam	16,000 platinum; 7,300 palladium; 2,400 rhodium; 4,200 iridium and ruthenium.
Do.	do.	Anglo American Platinum Ltd., 85%	Union Mine at Swartklip	10,700 platinum; 4,600 palladium; 1,800 rhodium; 3,100 iridium and ruthenium.
Do.	do.	Bafokeng Rasimone Platinum Mine (Royal Bafokeng Nation, 67%, and Anglo American Platinum Ltd., 33%)	Bafokeng Rasimone Platinum Mine at Rasimone	5,900 platinum; 2,400 palladium; 790 ruthenium; 460 rhodium; 150 iridium.
Do.	do.	Kroondal Platinum Mines (Anglo American Platinum Ltd., 50%, and Aquarius Platinum Ltd., 50%)	Kroondal Mine	7,800 platinum; 3,800 palladium; 2,300 ruthenium; 1,500 rhodium; 550 iridium.
Do.	do.	Modikwa Platinum Mine (Anglo American Platinum Ltd., 50%, and African Rainbow Minerals, 50%)	Modikwa Mine at Makgemeng	4,200 platinum; 4,000 palladium; 1,200 ruthenium; 820 rhodium; 310 iridium.
Do.	do.	Anglo American Platinum Ltd. (Amplats)	Mogalakwena Mine at Ga-Masenya	10,600 platinum; 10,900 palladium; 700 rhodium; 760 iridium and ruthernium.
Do.	do.	Anglo American Platinum Ltd., 50%, and XK Platinum Partnership, 50%	Mototolo Mine at Steelpoort	4,100 platinum; 2,400 palladium; 630 rhodium; 1,300 iridium and ruthernium.
Do.	do.	Anglo American Platinum Ltd. (Amplats)	Polokwane smelter at Polokwane, Mortimer smelter at Swartklip, and Waterval smelter	85,000 platinum; 48,000 palladium; 12,000 rhodium.
Do.	do.	do.	Precious metals refinery	81,000 platinum; 45,700 palladium; 10,800 rhodium; 18,800 iridium and ruthernium.
Do.	do.	Impala Platinum Ltd. (Implats)	Impala Mines, near Phokeng in North West Province	29,500 platinum; 16,000 palladium; 6,600 ruthenium; 4,000 rhodium; 1,600 iridium.

See footnotes at end of table.

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TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Platinum-group metals—Continued	kilograms	Impala Platinum Ltd. (Implats)	Marula Mine at Bothashoek	2,200 platinum; 2,300 palladium; 630 ruthenium; 460 rhodium; 180 iridium.
Do.	do.	do.	Smelter near Phokeng	81,000 platinum; 52,600 palladium; 11,600 rhodium; 17,000 gold, iridium, and ruthenium.
Do.	do.	do.	Precious metals refinery, near Springs in Guateng Province	71,500 platinum metal; 46,400 palladium metal; 10,200 rhodium metal; 15,000 gold, iridium, and ruthenium.
Do.	do.	Lonmin plc	Marikana and Pandora Mines	24,900 platinum; 11,600 palladium; 5,300 ruthenium; 3,400 rhodium; 1,100 iridium.
Do.	do.	do.	Precious metals refinery at Western Platinum	31,000 platinum metal; 14,600 palladium metal; 7,000 ruthenium metal; 4,300 rhodium metal; 1,400 iridium metal.
Do.	do.	Northam Platinum Ltd. (Anglo American Platinum Ltd., 22.5%, and Mvelaphanda Resources Ltd., 21.9%)	Zondereinde Mine near Northam	9,400 platinum; 4,600 palladium; 1,100 rhodium.
Do.	do.	do.	Booysendal Mine	2,900 platinum; 1,600 palladium; 470 rhodium.
Do.	do.	Marikana Platinum Mine (Anglo American Platinum Ltd., 50%, and Aquarius Platinum Ltd., 50%)	Marikana Mine	2,700 platinum; 1,300 palladium; 760 ruthenium; 480 rhodium; 210 iridium.
Do.	do.	Aquarius Platinum Ltd.	Everest Platinum Mine at Lydenburg[1]	3,800 platinum; 2,100 palladium; 1,100 ruthenium; 640 rhodium; 230 iridium.
Do.	do.	do.	Blue Ridge Mine[1]	3,900 platinum-group metals.
Do.	do.	Platmin Ltd.	Pilanesberg Mine	5,400 platinum; 1,700 palladium; 490 rhodium.
Do.	do.	Glencore Xstrata plc, 74%	Eland Mine at Brits	7,500 platinum-group metals.
Do.	do.	Atlatsa Resource Corp., 51%, and Anglo American Platinum Ltd., 49%	Bokoni Mine at Sefateng	4,100 platinum; 2,700 palladium; 470 rhodium.
Do.	do.	Two Rivers Platinum Mine (Pty) Ltd. (African Rainbow Minerals Ltd., 55%, and Impala Platinum Holdings Ltd., 45%)	Two Rivers Platinum Mine near Steelpoort	4,600 platinum; 2,700 palladium; 1,300 ruthenium; 780 rhodium; 310 iridium.

See footnotes at end of table.

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TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Platinum-group metals—Continued	kilograms	Eastern Platinum Ltd. (Eastplats)	Crocodile River Mine at Arbourfell[1]	3,100 platinum; 1,300 palladium; 950 ruthenium; 520 rhodium; 220 iridium.
Do.	do.	Tharisa Minerals (Pty) Ltd.	Tharisa Mine	2,700 platinum; 710 palladium; 530 ruthenium; 360 rhodium; 170 iridium.
Do.	do.	Nkomati Joint Venture	Nkomati Mine in Mpumalanga Province	4,300 platinum-group metals.
Do.	do.	Platinum Australia Pty Ltd. (PLA)	Smokey Hills Mine[1]	3,000 platinum-group metals.
Do.	do.	Sylvania Platinum Ltd.	Sylvania Dump Operations	1,600 platinum-group metals.
Pyrophyllite		Idwala Industrial Minerals (Benoni)	Ottsdal Mine in North West Province	15.
Do.		Wonderstone Ltd. (The Associated Ore & Metals Corp. Ltd.)	Pyrophyllite (wonderstone) mine, North West Province	NA.
Do.		G&W Base and Industrial Minerals Pty. Ltd.	Piet Retief Mine	NA.
Selenium	kilograms	Impala Platinum Ltd. (Implats)	Impala and Marula Mines	12,000.[e]
Do.	do.	Palabora Mining Co. Ltd.	Palabora Mine and plant at Phalaborwa	10,000.[e]
Silicon		Grupo Ferroatlantica	Polokwane plant, near Pietersburg	55 silicon metal.
Silver:				
Mine	metric tons	Vedanta Resources plc	Black Mountain Mine	50 mined silver.
Refined	do.	Rand Refinery Ltd.	Germiston, Gauteng Province	200 refined silver.
Sulfur		Sasol Synthetic Fuels (Pty) Ltd.	Plant at Secunda	180.
Do.		South African Petroleum Refineries	Plant at Durban	63.
Do.		Engen Petroleum Ltd.	do.	47.
Do.		National Petroleum Refiners of South Africa (Pty) Ltd.	Plant at Sasolburg	44.
Do.		Caltex Oil SA (Pty) Ltd.	Plant at Cape Town	30.
Synthetic fuels	thousand 42-gallon barrels	Sasol Synthetic Fuels (Pty) Ltd.	Coal to oil plant at Secunda	58,400.
Do.	do.	Petroleum Oil and Gas Corporation of South Africa	Natural gas to petroleum products plant at Mossel Bay	16,400.
Tellurium	kilograms	Palabora Mining Co. Ltd.	Palabora Mine and plant at Phalaborwa	5,300.[e]
Do.	do.	Impala Platinum Ltd. (Implats)	Impala and Marula Mines	5,000.[e]
Titanium:				
Titanium concentrates		Richards Bay Minerals (RBM) (Rio Tinto plc, 74%, and Horizon Investments, 24%)	Open cast operations, near Richards Bay	2,000 ilmenite;[e] 100 rutile.[e]
Do.		Tronox Ltd., 74% (Exxaro Resources Ltd., 44.65%)	KZN Sands Mine near Richards Bay[1]	550 ilmenite; 30 rutile.
Do.		do.	Namakwa Mine near Brand-se-Baai and mineral separation plant at Koekenaap	540 ilmenite; 31 rutile.
Titanium slag		Richards Bay Minerals (RBM)	Smelter at Richards Bay	1,050 titanium slag.
Do.		Tronox Ltd., 74%	Empangeni smelter near Richards Bay	220 titanium slag.
Do.		do.	Smelter at Vredenberg, Saldanha Bay area	190 titanium slag.
Do.		Evraz Highveld Steel and Vanadium Ltd.	Steel plant at Witbank	48 titanium slag.[e]
Uranium oxide	metric tons	AngloGold Ashanti Ltd.	Vaal Rivers operation, near Klerksdorp	3,000.
Do.	do.	First Uranium Corp.	Ezulwini Mine	100.[e]
Vanadium pentoxide	do.	Highveld Steel and Vanadium Ltd. (Ervaz Group S.A., 79%)	Mapochs Mine near Lydenburg	17,500.
Do.	do.	do.	Plant at Witbank	10,800.
Do.	do.	Glencore Xstrata plc, 74%	Rhovan Mine at Brits	10,000.

See footnotes at end of table.

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TABLE 2—Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Vanadium pentoxide—Continued	metric tons	Vanchem Vanadium Products Pty Ltd.	Plant at Witbank	5,000.[e]
Do.	do.	Vametco Minerals Corp.	Vametco Mine and plant near Brits	3,800.
Vermiculite		Palabora Mining Co. Ltd.	Palabora Mine and plant at Phalaborwa	200.
Wollastonite	metric tons	Namaqua Wollastonite (Pty) Ltd.	Magata Mine	2,400.[e]
Zinc		Zinc Corp. of South Africa Ltd. (Lebonix (Pty) Ltd., 100%)	Struisbult Springszinc refinery at Springs, southeast of Johannesburg[1]	110 refined zinc; 170 sulfuric acid.
Do.		Black Mountain Mineral Development Co. (Pty) Ltd.	Black Mountain Mine near Aggeneys in Northern Cape Province	40 zinc in concentrate.
Zirconium		Richards Bay Minerals (RBM)	Open cast mines near Richards Bay	300 zircon in concentrate.
Do.		Tronox Ltd., 74%	Namakwa Mine near Brand-se-Baai and mineral separation plant at Koekenaap	135 zircon in concentrate.
Do.		do.	Hillendale Mine near Richards Bay, KwaZulu Natal Province	60 zircon in concentrate.

[e]Estimated. Do., do. Ditto. NA Not available.
[1]Not operating at the end of 2013.
[2]Data from International Copper Study Group.

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TABLE 3
SOUTH AFRICA: RESERVES OF MAJOR MINERALS IN 2013[1]

(Million metric tons unless otherwise specified)

Commodity		Reserves
Andalusite[2]		51
Antimony	thousand metric tons	21
Chromium, ore		3,100
Coal, recoverable		30,156
Copper		11
Fluorspar		41
Gold	thousand metric tons	6
Iron ore		650
Lead	thousand metric tons	300
Manganese, ore		150
Nickel	thousand metric tons	3,700
Phosphate rock		1,500
Platinum-group metals	thousand metric tons	63
Titanium minerals		71
Vanadium	thousand metric tons	3,640
Vermiculite		14
Zinc		14
Zirconium		14

[1]Reserves for metallic minerals are given in metallic element content.

[2]Includes aluminosilicate and sillimanite.

Source: Mnguni, Mildred, 2013, General review, *in* South Africa's Mineral Industry 2012/2013: Johannesburg, South Africa, Department of Mineral Resources of the Republic of South Africa, p. 1–36.

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The Mineral Industry of South Sudan

By Thomas R. Yager

South Sudan is composed of the former Sudanese States of Central Equatoria, Eastern Equatoria, Jonglei, Lakes, Northern Bahr el Ghazal, Unity, Upper Nile, Warrap, Western Bahr el Ghazal, and Western Equatoria. The country became independent from Sudan on July 9, 2011. South Sudan was not a regionally or globally significant producer or consumer of minerals and mineral fuels in 2013. Crude petroleum production, however, played a central role in the South Sudanese economy.

After independence, Sudan's oilfields were divided between South Sudan and Sudan, but control of the Abyei Area was disputed by the Governments of South Sudan and Sudan. On December 15, 2013, civil war that was unrelated to the Abyei dispute broke out in Juba. Within 2 weeks, combat had spread to the oil-producing States of Unity and Upper Nile (Vogt, 2013).

Investment in Sudan's petroleum and petrochemical industries by U.S. individuals and organizations was banned by Executive Order 13412, which was issued by the President of the United States on October 13, 2006. The alleged use of revenues from petroleum sales to finance military operations in the Darfur conflict constituted the primary reason for the Executive order. U.S. individuals and organizations were banned from participating in the refining of South Sudanese crude petroleum in refineries located in Sudan (Bush, 2006; U.S. Office of Foreign Assets Control, 2011).

In 2012, the National Legislature of South Sudan passed the Mining Act of 2012 and the Petroleum Act of 2012. The Mining Act was signed into law on March 7, 2013. The Mining Act established renewable exploration licenses and nonrenewable reconnaissance licenses for mineral exploration with terms of 5 and 2 years, respectively. Large-scale, small-scale, and artisanal mining licenses were also established. The Mining Act set the corporate tax rate at 20% and allowed the Government to purchase as much as a 15% share in large-scale mining operations (Dau, 2013, p. 6, 15–16; Metal Bulletin, 2013).

In mid-March, the Government announced that it had repealed all 53 licenses granted by the Ministry of Mines and all other licenses by State governors before the passage of the Mining Act. The Government granted grandfather rights to two companies and allowed other companies to apply for grandfather rights (Metal Bulletin, 2013).

Minerals in the National Economy

In 2013, the petroleum sector accounted for 14.7% of the gross domestic product (GDP) compared with 7.4% in 2012 and 61.3% in 2011. Fluctuations in the share of the petroleum sector in the GDP were attributable to decreased petroleum production in 2012 and increased petroleum production in 2013 (South Sudan National Bureau of Statistics, 2014).

Production

In 2013, South Sudan's crude petroleum production increased by an estimated 389% after decreasing by an estimated 84% in 2012. Gold and construction materials, such as brick clay, were also produced but no output was reported (table 1).

Structure of the Mineral Industry

Crude petroleum was produced by joint ventures of state-owned companies from China, India, Malaysia, and South Sudan. Nile Petroleum Corp. (Nilepet), which was owned by the Government of South Sudan, held shares of at most 8% in the petroleum joint-venture projects. Gold was produced by artisanal miners.

Commodity Review

Metals

Gold.—Artisanal miners produced gold at Nanakanak in Eastern Equatoria State. In January 2013, the Government renewed the exploration licenses for Equator Gold Ltd. of the United Kingdom at the Luri project and for New Kush Exploration & Mining Ltd. (NKEM) at the Eastern Equatoria Kapoeta project. NKEM planned to spend between $10 million and $20 million on exploration at Eastern Equatoria Kapoeta by the end of 2015 (Dau, 2013, p. 19).

Industrial Minerals

Cement.—South Sudan imported all its cement requirements in 2013. Cement consumption was estimated to be about 350,000 metric tons in 2012. Dangote Cement plc of Nigeria planned to build a new plant in South Sudan with a capacity of 1.5 million metric tons per year by 2016 (Dangote Cement plc, 2013; International Cement Review, 2013).

Mineral Fuels

Petroleum.—All South Sudan's crude petroleum production was exported through pipelines that ran through Sudan. In 2011, South Sudan paid a pipeline transit fee of $4 per barrel for existing oilfields and had agreed to pay a transit fee of $7 per barrel for oil from oilfields that might be discovered in the future. Late in 2011, however, the Government of Sudan demanded that South Sudan pay between $32 and $36 per barrel as compensation for revenues lost after secession. In December 2011, the Government of Sudan started to divert South Sudanese petroleum exports to its refineries. In response, the Government of South Sudan suspended all South Sudanese crude petroleum production by the end of January 2012 (Petroleum Economist, 2011; Patey, 2014).

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In March 2013, an agreement between the Governments of South Sudan and Sudan on transit fees through 2015 came into force. South Sudan agreed to pay $11 for petroleum transported from Blocks 1, 2, and 4, and $9.10 per barrel for petroleum transported from Blocks 3 and 7. In addition, South Sudan agreed to pay $3 billion to Sudan as compensation for lost revenues. South Sudan's petroleum production restarted in April 2013 (Petroleum Economist, 2013; Patey, 2014).

The Greater Nile Petroleum Operating Co. [China National Petroleum Corp. (CNPC) (40%), Petronas Carigali Overseas Shd. Bhd. of Malaysia, (30%), ONGC Videsh Ltd. of India (25%), and Nile Petroleum Corp. (Nilepet) (5%)] produced crude petroleum at the El-Haar, the El-Nar, the El-Toor, the Khairat, the Khairat Northeast, the Toma South, and the Unity oilfields in Blocks 1, 2, and 4, which were located in Unity State. In late 2013, production from the oilfields located south of the South Sudan-Sudan national border in Blocks 1, 2, and 4 was about 40,000 barrels per day (bbl/d) (Dau, 2013, p. 7).

Block 5A is located in the Muglad Basin in Unity State. Block 5A was held by White Nile Petroleum Operating Co. [Petronas (67.9%), ONGC Videsh (24.1%), and Nilepet (8%)]. Output was about 5,000 bbl/d in late 2013. In late December, ONGC Videsh announced the suspension of production in Blocks 1, 2, 4, and 5A because of civil war (Dau, 2013, p. 7; Vogt, 2013).

Blocks 3 and 7 in Upper Nile State were held by the Petrodar Consortium [CNPC (41%), Petronas (40%), Nilepet (8%), China Petroleum and Chemical Corp. (6%), and Tri-Ocean Energy of Egpyt (5%)]. In late 2013, production from Blocks 3 and 7 was about 200,000 bbl/d (Dau, 2013, p. 7).

Total S.A. of France and its joint-venture partners held Block B in Jonglei State. In September 2013, the Government announced plans to divide Block B into Blocks B1, B2, and B3. The Government planned to invite bids for the exploration rights to Block B3 (Thomson Reuters, 2013).

All South Sudan's petroleum products requirements were imported. Nilepet and Safinat Group of Russia had planned to start construction on a new 5,000-bbl/d-capacity refinery at Bentiu in Unity State in July 2013 and to start production by yearend. In late November, the Government announced plans to start construction by yearend; the project was postponed because of poor road conditions that delayed deliveries of equipment. The Government also announced plans to complete construction of a 12,000-bbl/d-capacity refinery in Unity State by the end of 2014 (Bariyo, 2013; Ngor, 2013).

In September 2012, the Governments of Kenya and South Sudan signed an agreement to build a new 2,000-kilometer crude petroleum pipeline between the two countries. The completion of the pipeline was scheduled for 2017. The estimated cost of the pipeline was about $3 billion (Muchira, 2012; Addis Fortune, 2013).

Outlook

Before the suspension of production in Blocks 1, 2, 4, and 5A, South Sudan's crude petroleum production had been expected to reach a peak of nearly 300,000 bbl/d in 2014 and to decline subsequently to less than 200,000 bbl/d by 2019 and less than 100,000 bbl/d by 2026 without substantial new investments. Higher levels of ouput may be sustained with new discoveries or increased recovery rates. The estimated cost of increasing recovery rates for a single field was about $300 million. During the suspension of production between the end of January 2012 and April 2013, the pipeline from Blocks 3 and 7 was filled with chemically treated water that accelerated internal corrosion. Further damage to the pipeline could result if civil war in Upper Nile State forces production to be suspended again (Dau, 2013, p. 8; Patey, 2014).

At the end of 2013, it was unclear when production would restart in Blocks 1, 2, 4, and 5A. The extent of delays in the opening of the cement plant and the petroleum pipeline and refineries because of the civil war were also unclear. The development of large-scale mines could take many years because of the lack of power and roads. South Sudan had only 300 kilometers of paved roads at the end of 2012 (Holland, 2013).

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TABLE 1
SOUTH SUDAN: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Thousand 42-gallon barrels)

Commodity[3]	2011	2012	2013
Petroleum, crude[e]	57,000 [r]	9,000 [r]	44,000

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised.
[1]Table includes data available through May 20, 2014.
[2]Data for 2011 are from July 9 to December 31; South Sudanese production was included in Sudan until independence on July 9, 2011.
[3]In addition to crude petroleum, gold and such construction materials as brick clay were produced, but available information is inadequate to estimate output.

TABLE 2
SOUTH SUDAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand 42-gallon barrels unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold kilograms	Artisanal miners	Mines at Nanakanak	NA
Petroleum, crude[1]	Petrodar Consortium [China National Petroleum Corp. (CNPC), 41%; Petronas Carigali Overseas Shd. Bhd., 40%; Nile Petroleum Corp. (Nilepet), 8%; China Petroleum and Chemical Corp., 6%; Tri-Ocean Energy, 5%]	Blocks 3 and 7 in Upper Nile State	91,500
Do.	Greater Nile Petroleum Operating Co. [China National Petroleum Corp. (CNPC), 40%; Petronas Carigali Overseas Shd. Bhd., 30%; ONGC Videsh Ltd., 25%; Nile Petroleum Corp. (Nilepet), 5%]	Blocks 1, 2, and 4 in Unity State[2, 3]	32,200
Do.	White Nile Petroleum Operating Co. [Petronas Carigali Overseas Shd. Bhd., 67.9%; ONGC Videsh Ltd., 24.1%; Nile Petroleum Corp. (Nilepet), 8%]	Block 5A in Unity State[3]	4,400

Do. Ditto. NA Not available.
[1]In addition to the facilities listed, about 1.8 million barrels per year of crude petroleum was produced in the Abyei Area, which was claimed by both South Sudan and Sudan.
[2]El-Haar, El-Nar, El-Toor, Khairat, Khairat Northeast, Toma South, and Unity oilfields only. The Bamboo, Bamboo West, Garaad, Heglig, Taiyib, and Toma oilfields remained in Sudan.
[3]Not operating at the end of 2013.

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The Mineral Industry of Sudan

By Thomas R. Yager

The mineral sector's influence on Sudan's economy was important because of petroleum production and refining. Between 2009 and 2012, cement and gold production became more important in the Sudanese economy. In recent years, the country also produced chromite, feldspar, fluorite, gypsum, kaolin, laterite, manganese ore, marble, mica, quartz, salt, silver, steel, and talc. Sudan was not a globally significant producer or consumer of mineral commodities in 2013.

Investment in Sudan's petroleum and petrochemical industries by U.S. individuals and organizations was banned by Executive Order 13412, which was issued by the President of the United States on October 13, 2006. The alleged use of revenues from petroleum sales to finance military operations in the Darfur conflict constituted the primary reason for the executive Order. U.S. individuals and organizations were banned from participating in the refining of South Sudanese crude petroleum in refineries located in Sudan (Bush, 2006; U.S. Department of the Treasury, Office of Foreign Assets Control, 2011, 2013).

Minerals in the National Economy

In 2013, the manufacturing sector accounted for 9% of Sudan's gross domestic product (GDP), and the mining and quarrying sector, 5.1%. Crude petroleum exports were valued at $3.91 billion, or 55% of total exports in 2013; gold exports were valued at $1.05 billion, or 15% of total exports; and petroleum product exports were valued at $101 million, or about 1% of total exports. The United Arab Emirates received 88% of Sudan's gold exports. In 2012, gold exports were valued at $2.16 billion, or 53% of total exports; crude petroleum exports, at $699 million or 17%; and petroleum product exports, at $256 million, or 6%. Refined petroleum imports were valued at $1.46 billion, or 15% of total imports in 2013, and iron and steel imports were valued at $711 million, or 7% of total imports (Bank of Sudan, 2014a, p. 118; 2014b, p. 12, 18, 29–30).

Production

In 2013, marble production increased by 770%; laterite, by 252%; refined gold, by an estimated 167%; kaolin, by 125%; chromite, by 69%; mica, by 54%; feldspar, by 21%; crude petroleum, by 20%; and gypsum, by 13%. Mined gold production decreased by 46%; mined silver, by an estimated 45%; and salt, by 21% (table 1; Bank of Sudan, 2014a, p. 141).

Structure of the Mineral Industry

Sudan's crude petroleum was produced by joint ventures of state-owned companies from China, India, Malaysia, and Sudan. The petroleum refineries were also state owned; Khartoum Oil Refinery Co. Ltd. was a joint venture between state-owned China National Petroleum Corp. (CNPC) and Sudan Petroleum Company Ltd. (Sudapet). The Government owned Sudanese Mining Co., which produced gypsum and mica, and Ingessana Hills Mining Corp., which produced chromite. The Government also owned Sudan Gold Refinery Co. Ltd. at Khartoum and a 56% share in the Hassai gold mine in northern Sudan; gold was also produced by about 500,000 artisanal miners. The cement plants were privately owned (Addis Fortune, 2013).

Commodity Review

Metals

Chromium.—Ingessana Hills Mines Corp. produced chromite from the Ingessana Hills ophiolite in southeastern Sudan. The company was expected to produce about 40,000 metric tons (t) in 2013 compared with 18,300 t in 2012; actual production was 30,870 t (Addis Fortune, 2013; Bank of Sudan, 2014a, p. 141).

Gold and Silver.—Artisanal miners accounted for most of Sudan's gold production. In 2013, reported gold exports decreased to 24,813 kilograms (kg) from 46,133 kg in 2012. The reduction in exports could be attributable to the depletion of near-surface deposits, decreased gold prices, civil unrest, and pit collapses (Laessing, 2012; Bank of Sudan, 2014b, p. 12).

In 2012, artisanal miners in the Jebel Amir District in North Darfur State produced about 14,000 kg of gold. In January and February 2013, hostilities between tribal warlords over control of the mines resulted in more than 400 deaths. Mining operations were partially suspended in early May by a pit collapse resulting from heavy rains that killed at least 60 miners (Bariyo, 2013, Ismail and Kumar, 2013, p. 3).

Ariab Mining Co. Ltd. (Government, 56%, and Weather Investments II SARL, 44%) operated the Hassai Mine in northeastern Sudan, which was the leading large-scale gold mine in the country. Since 1992, total production at the Hassai Mine was about 72,000 kg of gold. Exploration was planned at depth at Hassai because of the impending depletion of near-surface deposits (Addis Fortune, 2013; Ismail and Kumar, 2013, p. 4).

In February 2013, Managem Group of Morocco announced plans to start construction of a new gold mine at Mining Block 15 in northeastern Sudan after completing a feasibility study. Managem planned to produce to about 10,000 kilograms per year (kg/yr) of gold by early 2017. Resources at Wadi Gadgaba in Mining Block 15 were estimated to be more than 120,000 kg of contained gold (Otmane, 2013).

In September, Orca Gold Inc. of Canada completed its second drilling program at the Galat Sufar South (GSS) prospect in Mining Block 14 in northeastern Sudan. The company planned to engage in further drilling and to complete an initial resource estimate for GSS by the end of the first quarter of 2014. Orca Gold also relinquished Mining Blocks 19 and 77 in southeastern Sudan and Block 67 in northern Sudan. Toro Gold Ltd. of the

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United Kingdom explored at Mining Block 12 near Port Sudan in early 2013 (Orca Gold Inc., 2013).

The Government completed a new refinery in Khartoum with capacities of 328,000 kg/yr of gold and 73,000 kg/yr of silver in September 2012. In December 2012, the Central Bank banned the export of unrefined gold to increase foreign exchange. Refined gold production increased to about 24,000 kg in 2013 from 9,000 kg in 2012 as the refinery had its first full year of production in 2013 (Gold Mining Journal, 2012; Ismail and Kumar, 2013, p. 3–4).

Industrial Minerals

Cement.—Sudan had eight cement plants with a combined capacity of 10.3 million metric tons per year. From 2009 to 2013, national cement production increased to an estimated 3.5 million metric tons (Mt) from 621,700 t. Output increased because of the expansion of Al-Rajhi Group's Atbara plant and the opening of six new plants from 2009 to 2011. The domestic cement industry had considerable excess capacity; the Government planned to export cement to Chad, Eritrea, Ethiopia, South Sudan, and North African and Gulf Cooperation Council countries (Bank of Sudan, 2013, p. 142; 2014a, p. 143; International Cement Review, 2013).

In 2013, Al-Rajhi Group produced 1.11 Mt of cement; Al-Shamal Cement Factory, 657,000 t; ASEC Cement Co. of Egypt (a subsidiary of Citadel Capital S.A.E. of Egypt), 644,000 t; Al-Salam Cement Production Company Ltd., 327,500 t; Nile Cement Company Ltd., 93,900 t; and Aslan Cement Co., 89,400 t. Increased production at Al-Salam Cement, Al-Shamal Cement, and Aslan Cement was offset by decreased production at Al-Rajhi, ASEC Cement, and Nile Cement in 2013. In 2012 (the latest year for which data were available), Berber Cement Company Ltd. produced 605,700 t (Bank of Sudan, 2013, p. 142; 2014a, p. 143).

Laterite.—Bricks were produced from lateritic soils, which have a high clay content. Many brick plants were located near Khartoum. In 2013, reported laterite production increased to 339,390 t from 96,400 t in 2012 and 24,500 t in 2011. The increase in reported output could be attributable to improved data collection (Bank of Sudan, 2014a, p. 141).

Stone, Dimension.—Sudanese marble production increased to 1,000 t in 2013 from 115 t in 2012. The increase could be a recovery from unusually low levels of output in 2012 (table 1).

Mineral Fuels

Petroleum.—In 2013, Sudan's production of crude petroleum increased to 45.2 million barrels (Mbbl) from 37.7 Mbbl in 2012. In 2012, the Governments of Norway and Sudan signed an agreement to increase the recovery rates of its currently producing wells to 47% from 23% (Arab Times, 2013; Bank of Sudan, 2014a, p. 139).

In 2013, the Greater Nile Petroleum Operating Co. [CNPC (40%), Petronas Carigali Overseas Shd. Bhd. of Malaysia (30%), ONGC Videsh Ltd. of India (25%), and Sudan Petroleum Company Ltd. (Sudapet) (5%)] produced crude petroleum in Blocks 1, 2, and 4 in south-central Sudan. After the referendum on South Sudan's independence from Sudan, Blocks 1, 2, and 4 were divided between Sudan and South Sudan. The Bamboo, Bamboo West, Garaad, Heglig, Taiyib, and Toma oilfields are located in Sudan (European Coalition on Oil in Sudan, 2010, p. 25).

In 2012, production from the oilfields north of the national boundary in Blocks 1, 2, and 4 was reported to be about 48,400 barrels per day (bbl/d). By May 2013, output increased to between 50,000 and 60,000 bbl/d (Economic Times, The, 2013; Sudan Petroleum Corp., 2013).

CNPC held Block 6, which is located to the northwest of Muglad in northern Sudan. In 2012, total production in Block 6 was reported to be about 59,100 bbl/d compared with 53,800 bbl/d in 2011. The new Hadida oilfield in Block 6 was producing at the rate of 10,000 bbl/d in January 2013; CNPC planned to increase output to 20,000 bbl/d by yearend (Arab Times, 2013; Sudan Petroleum Corp., 2013).

In late 2012, Star Oil Co. [Ansan Wikfs Investments Ltd. of Yemen (66%) and Sudapet, (34%)] started production at the South Annajma oilfield in Block 17 at the rate of 6,000 bbl/d. In 2013, Star Oil planned to increase production to between 10,000 bbl/d and 15,000 bbl/d at South Annajma, which is located north of Block 6. The company subsequently revised its production target to 11,000 bbl/d by 2014 (Africa Energy Intelligence, 2013; Arab Times, 2013; Sudan Petroleum Corp., 2013).

CNPC operated the Khartoum oil refinery at Jali in northern Sudan with a capacity of 100,000 bbl/d; the company accounted for most of Sudan's refined petroleum products output. The refineries in Port Sudan and El-Obeid had capacities of 25,000 bbl/d and 15,000 bbl/d, respectively. The Government was considering an expansion of the Khartoum oil refinery to 200,000 bbl/d, and Port Sudan and El-Obeid, to 50,000 bbl/d each. No further details as to when the expansion might take place were available (Arab Times, 2013).

Outlook

Sudan's crude petroleum production is likely to increase modestly in 2014 because of expansions in Blocks 6 and 17. Production levels are also expected to increase depending on results of efforts to increase recovery rates. Crude petroleum production, especially in Blocks 2 and 4, could be affected by disputes with South Sudan over the Abyei Area. The Government's plans to expand refinery capacity could increase output of refined petroleum products.

Gold production is likely to increase in the near future because of new production by Managem and other large-scale producers. Production at the mines in the Jebel Amir District is likely to depend on the country's political stability. The outlook for chromite production is expected to depend heavily upon world stainless steel markets.

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TABLE 1
SUDAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
Cement, hydraulic		621,700	1,929,700	3,002,300	3,511,000 r	3,500,000 e
Chromite, mine output, gross weight[3]		14,087	56,823	64,128	18,300	30,870
Feldspar		--	923	9,519	26,283	31,700
Fluorite		NA	NA	NA	950	1,000 e
Gold:						
Mine output, Au content[4]	kilograms	14,914	26,317	23,739	46,133	24,813
Refined	do.	--	--	--	9,000 e	24,000 e
Gypsum		30,000	31,000	13,000	117,073	132,000
Kaolin		36,799	32,696	15,096	11,579	26,000
Laterite		NA	NA	24,500	96,400	339,390
Manganese ore		500	--	--	-- e	3,250
Marble	cubic meters	--	1,625	1,214	115	1,000
Mica		100	10	378	324	500
Petroleum:						
Crude, including lease condensate[5]	thousand 42-gallon barrels	173,453	168,656	106,216	37,737	45,200
Refinery products:						
Liquefied petroleum gas	do.	3,915	3,798	3,617	3,217 r	2,942
Gasoline	do.	9,488	10,593	9,811	9,381	8,613
Naphtha	do.	207	180	177	75 r	164
Jet fuel	do.	981	1,059	1,062	935 r	630
Kerosene	do.	240	196	186	62	150
Distillate fuel oil	do.	19,115	17,489	15,460	12,600 r	11,894
Residual fuel oil	do.	2,108	1,732	1,830	663	1,426
Petroleum coke	do.	1,713	1,774	1,571	1,477	1,408
Total	do.	37,767	36,821	33,714	28,410 r	27,227
Quartz		NA	NA	NA	5,292	5,300 e
Salt		35,793	141,840	10,791	26,315	20,800
Silver:						
Mine output, Ag content	kilograms	413	631	570 r,e	1,100 r,e	600 e
Refined	do.	--	--	--	200 e	500 e
Steel, semimanufactured[e]		550,000 r	580,000 r	400,000	400,000	400,000
Talc		1,167	--	--	-- e	-- e

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. NA Not available. -- Zero.

[1]Table includes data available through October 22, 2014.

[2]In addition to the commodities listed, the following are presumably produced, although available information is inadequate to estimate output: clay and (or) shale for cement manufacture [normally about 0.4 metric ton of clay and (or) shale per metric ton of finished cement]; limestone for agriculture, cement manufacture (normally 1.4 metric tons per metric ton of finished cement), construction aggregate and fill, and lime manufacture; and other construction materials (clays, sand and gravel, stone, and others for local use).

[3]Presumed to be ores and concentrates with an estimated average grade of about 54% chromic oxide.

[4]Reported exports.

[5]For 2011, South Sudanese production is included only for the period before independence on July 9. South Sudanese production is not included in 2012 or 2013.

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TABLE 2
SUDAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013[1]

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Atbara Cement Company Ltd. (subsidary of Al-Rajhi Group)	Plant at Atbara	1,850,000
Do.		ASEC Cement Co. (subsidiary of Citadel Capital S.A.E.)	Plant at Takamol	1,600,000
Do.		Berber Cement Company Ltd.	Plant at Berber	1,580,000
Do.		Aslan Cement Co.	NA	1,500,000
Do.		Nile Cement Company Ltd.	Plant at Rabak	1,500,000
Do.		Al-Shamal Cement Factory (Mass Global Investment Co.)	Plant at Atbara	1,480,000
Do.		Al-Salam Cement Production Company Ltd.	do.	660,000
Do.		Sudanese Cement Factory	Plant in Nile State	100,000
Chromite		Ingessana Hills Mines Corp.	Mine at Ingessana Hills	48,000
Gold:				
Mine	kilograms	Artisanal miners	Jebel Amir Mines in North Darfur State	15,000 e
Do.	do.	do.	Various locations	30,000 e
Do.	do.	Ariab Mining Co. Ltd. (Government of Sudan, 56%, and Weather Investments II SARL, 40%)	Mine at Hassai	2,000
Refined	do.	Sudan Gold Refinery Co. (Government, 100%)	Refinery at Khartoum	328,000
Gypsum		Sudanese Mining Corp. (Government of Sudan, 100%)	Bir Eit Mine in Red Sea State	15,000
Limestone		Al-Salam Cement Production Co. Ltd.	Mine in River Nile State	730,000 e
Do.		Al-Rajhi Group	Mine at Atbara	500,000
Do.		Nile Cement Company Ltd.	Mine at Rabak	200,000
Mica		Sudanese Mining Corp. (Government of Sudan, 100%)	Mines at Sheriek	1,800
Petroleum:				
Crude	thousand 42-gallon barrels	China National Petroleum Corp., 95%	Block 6 near Muglad	26,000 e
Do.	do.	Greater Nile Petroleum Operating Co. [China National Petroleum Corp. (CNPC), 40%; Petronas Carigali Overseas Shd. Bhd., 30%; ONGC Videsh Ltd., 25%; Sudan Petroleum Company Ltd. (Sudapet), 5%]	Blocks 1, 2, and 4 in Unity State[2]	22,000
Do.	do.	Star Oil Co. [Ansan Wikfs Investments Ltd., 66%, and Sudan Petroleum Company Ltd. (Sudapet), 34%]	Block 17 in South Kordofan State	2,200
Refined	do.	Khartoum Oil Refinery [China National Petroleum Corp. (CNPC), 50%, and Sudan Petroleum Company Ltd. (Sudapet), 50%]	Refinery at Jali	36,500
Do.	do.	Port Sudan Refining Ltd. (Government of Sudan, 100%)	Refinery at Port Sudan	9,100
Do.	do.	El-Obeid Refinery Co. (Government of Sudan, 100%)	Refinery at El-Obeid	5,500
Salt		Bittar Salt Company Ltd. (subsidiary of El-Nilein Holding Co.)	Mine at Port Sudan	100,000
Silver, refined	kilograms	Government of Sudan	Refinery at Khartoum	73,000
Steel:				
Crude		Sudan Master Technology	Plant at Giad Industrial City	60,000
Rebar		Al-Assad Steel Bar Factory	Plant at Khartoum	394,000
Do.		Sudan Master Technology	Plant at Giad Industrial City	150,000
Do.		Sudanese Steel Products Ltd. (subsidiary of Hafez Elsayad Barbary Ltd.)	Plant at Khartoum	150,000
Do.		Sudanese Malaysian Factory	do.	100,000
Galvanized		Sudanese Steel Products Ltd.	do.	20,000

eEstimated. Do., do. Ditto. NA Not available.

[1]In addition to the facilities listed, about 1.8 million barrels per year of crude petroleum were produced in the Abyei Area, which was claimed by both South Sudan and Sudan.

[2]Bamboo, Bamboo West, Garaad, Heglig, Taiyib, and Toma oilfields only. Before July 9, 2011, capacity was 47 million barrels per year and included the El-Haar, El-Nar, El-Toor, Khairat, Khairat Northeast, Toma South, and Unity oilfields, which became part of South Sudan after independence on July 9, 2011.

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The Mineral Industry of Swaziland

By Philip M. Mobbs[1]

The mineral industry of Swaziland was not a significant contributor to the country's gross domestic product (GDP). The country's nominal GDP was estimated to be about $3.8 billion in 2013.[2] Exports of iron ore, which were valued at about $115 million, and exports of anthracite coal, which were valued at about $26 million, accounted for about 7.5% of total Swazi exports, which were valued at about $1.9 billion in 2013 (International Monetary Fund, 2014, p. 32).

The Mining Department of the Ministry of Natural Resources and Energy is responsible for the administration of the mineral sector. The mineral sector is regulated by the provisions of the Diamond Act No. 3 of 2011, the Explosive Act No. 4 of 1961, the Mines and Minerals Act No. 4 of 2011, and the Mines and Quarries (Safety) Regulations.

Production

The main minerals produced in 2013 included aggregate (crushed stone), coal, and iron ore. Compared with the previous year, coal production was estimated to have increased by about 35% in the fiscal year that ended on March 31, 2014; iron ore output, by 16%; and clay, by 11% (table 1).

Structure of the Mineral Industry

Tibiyo Taka Ngwane, which was a Swazi National Organization, held 25% interest in the larger mining operations in Swaziland for the Swazi people. The locations and capacities of the principal mining operations in Swaziland are in table 2.

Commodity Review

Anthracite coal from the Maloma Mine was shipped to South Africa by Maloma Colliery Ltd., which was a joint venture of Carbonex (Proprietary) Ltd. [a subsidiary of Chancellor House (Proprietary) Ltd. of South Africa], 75%, and Tibiyo Taka Ngwane, 25%. Stone was quarried and crushed at various sites for use in domestic construction projects.

Metals

Iron Ore.—The venture of Salgaocar Swaziland (Proprietary) Ltd. (a subsidiary of the Salgaocar Group of Companies of India), 50%, iNgwenyama, 25%, and Tibiyo Taka Ngwane, 25%, recovered iron ore from the Ngwenya Mine tailings dumps, which were located north of Ngwenya. The Ngwenya open pit mine most recently had operated from 1964 until 1977. The iron ore, which contained about 44% to 50% iron, was trucked to Mpaka, transferred to rail cars, and subsequently deposited at the docks at Maputo, Mozambique, for shipment to China. In 2013, Salgaocar was building a beneficiation plant to upgrade the Ngwenya iron ore to between 58% and 61% iron content (Kimbell, 1966, p. 785; Stevens, 1981, p. 1124; Geological Survey and Mines Department, 2006, p. 13; Swazi Observer, 2013; Swaziland Review, 2014).

Industrial Minerals

Diamond.—Continued delays by Roux Consolidated Investment (Proprietary) Ltd. on the expected redevelopment of the Dvokolwako diamond mine, which was located about 50 kilometers northeast of Mbabane, resulted in the Government canceling Roux Consolidated's mining license in November 2012. The 20-year mining license had been issued in 2008. In 2013, the Government received five bids from other companies interested in reopening the Dvokolwako Mine, which Trans Hex Ltd. of South Africa had closed in 1996 (Coakley, 1998; Magagula, 2013; Kingdom of Swaziland, 2014, p. 4).

Outlook

Potential changes in the mineral industry in the near future include proposed new aggregate quarries near Mbabane, Nhlangano, Pigg's Peak, and Sphofaneni. Exploration and evaluation of the gold occurrences around the former Pigg's Peak gold mine are expected to continue. The low level of exploration and development in the recent past, the high level of HIV/AIDS infections (which has adversely affected an estimated 27.4% of the Swazi population aged 15 to 49), and the lack of infrastructure are expected to continue to constrain Swaziland's mineral resource development and production (UNAIDS Secretariat, 2014).

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[1]Deceased.

[2]Where necessary, values have been converted from Swazi emalangeni (SZL) to U.S. dollars (US$) at the average exchange rate of SZL9.7=US$1.00 for 2013.

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TABLE 1
SWAZILAND: PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2009	2010	2011	2012	2013[e]
Aggregate, crushed stone	cubic meters	202,319	304,544	206,341	308,440	295,430 [4]
Clay for bricks	do.	35,000 [e]	35,535	35,584	36,000 [e]	40,000
Coal, anthracite		129,647	145,903	121,050	152,284	205,000
Iron ore, gross weight		-- [e]	-- [e]	79,553	1,032,230	1,200,000

[e]Estimated; estimated data are rounded to no more than three significant digits. -- Zero.
[1]Table includes data available through September 12, 2014.
[2]Data are for fiscal year that runs from April 1 to March 31.
[3]In addition to the commodities listed, modest quantities of crude construction materials (sand and gravel), kaolin, pyrophyllite (talc), and soapstone are produced, but output is not reported quantitatively and information is inadequate to make reliable estimates of output.
[4]Reported.

TABLE 2
SWAZILAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aggregate, crushed stone	Camdel Construction (Proprietary) Ltd.	Kwalini Quarry, Matsapha	NA
Do.	Mbabane Quarry (Proprietary) Ltd.	Mbabane Quarry, Mahamba	NA
Bricks	Langa Brick (Fortis Enterprises Ltd.)	Mpaka	640,000
Do.	Mangweni Bricks	Kwalini Quarry, Matsapha	NA
Do.	INO Investment Co.	Portable plant	NA
Coal	Maloma Colliery Ltd. [Carbonex (Proprietary) Ltd., 75%, and Tibiyo Taka Ngwane, 25%]	Maloma Mine at Maloma	500,000
Iron ore	Venture of Salgaocar Swaziland (Proprietary) Ltd. (Salgaocar Group of Companies), 50%; iNgwenyama, 25%; and Tibiyo Taka Ngwane, 25%	Ngwenya Mine, 2 kilometers north of Ngwenya	1,500,000

Do. Ditto. NA Not available.

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THE MINERAL INDUSTRY OF TANZANIA

By Thomas R. Yager

In 2013, Tanzania played an important role in the global production of gold, accounting for nearly 1.6% of the world's gold mine output (George, 2014). The country was also the world's only producer of tanzanite. Other domestically important mining and mineral processing operations included cement and natural gas. Tanzania was not a globally important consumer of minerals or mineral fuels in 2013.

Minerals in the National Economy

In 2013, the manufacturing sector accounted for 8.5% of the gross domestic product, and mining and quarrying, for 3.3%. The value of output in the mining sector increased by 6.9% in 2013 compared with 7.8% in 2012. About 670,000 artisanal miners were estimated to produce colored gemstones, diamond, gold, and other commodities in 2012 (the latest year for which data were available); employment in large-scale mines was about 12,000 workers (Engineering & Mining Journal, 2012; Bank of Tanzania, 2014a, p. 38, 44).

Government Policies and Programs

Tanzania is a signatory to the Kimberley Process Certification Scheme, which is a certification system established to reduce the trade in conflict diamond. In 2010, the Government passed the Mining Act of 2010, which increased royalties, required companies to list domestically, allowed the Government to take a share in future mining projects, and restricted foreign participation in small-scale mining. In late 2012, the Government issued new regulations requiring all foreign-owned mining companies to cede 50% of their shares in their Tanzanian operations to the Tanzanian public. The regulations applied to new mining licenses and could be met by giving a 50% share in the operation to Government-owned State Mining Co. (Stamico) or by listing on the Dar es Salaam stock exchange and selling 50% of the shares in the operation to Tanzanian companies or individuals (Kabukuru, 2013; Pesa Times, 2013).

Production

In 2013, marble production increased by 398%; limestone, by 218%; gypsum, by 206%; coal, by 64%; diamond and lime, by 41% each; tanzanite, by 19%; and sapphire, by an estimated 13%. The production of pozzolanic materials decreased by 30%; kaolin, by 16%; and bauxite, by an estimated 14% (table 1).

Structure of the Mineral Industry

Tanzania's gold mines were privately owned; the Minjingu phosphate mines and the Nyanza salt mines were also owned by private investors. In 2013, Stamico purchased a 50% share in the tanzanite mine held by Richland Resources Ltd. of Bermuda. The Government held minority interests in the privately owned Ngaka coal mine and the Williamson diamond mine. Artisanal miners accounted for most of the country's colored gemstone production; crushed stone, diamond, and gold were also produced by artisanal miners (table 2; Mining Journal, 2013).

Mineral Trade

Gold exports decreased in value to $1.73 billion in 2013 from $2.2 billion in 2012. The share of gold in total exports was 32.4% in 2013; and colored gemstones, copper, diamond, silver, and other minerals combined, 2.4%. Imports of petroleum products increased in value to $4.31 billion in 2013 from $3.39 billion in 2012. Petroleum products accounted for 39.1% of the value of total imports, and fertilizers, 1.5% (Bank of Tanzania, 2014b, p. 16–17).

Commodity Review

Metals

Cobalt and Nickel.—In late 2013, IMX Resources Ltd. of Australia and MMG Ltd. of China formed a joint venture to explore at the Nachingwea project in southeastern Tanzania. IMX and MMG subsequently initiated a drilling program; the companies hoped to identify resources of 400,000 metric tons (t) of contained nickel at grades of at least 1.5% nickel. MMG planned to spend as much as $60 million at Nachingwea over a 5-year period (Washbourne, 2014).

African Eagle Resources plc (AER) of the United Kingdom had planned to complete a feasibility study on a new mine at the Dutwa project, which consists of the Ngasamo and the Wamangola nickel-cobalt laterite deposits, in the first quarter of 2013. Depending on the results of the studies, AER planned to produce about 27,000 metric tons per year (t/yr) of nickel in concentrate. The life of the mine was estimated to be more than 20 years. In mid-2013, AER halted work on the project because of a lack of funding to complete the feasibility study. The company subsequently sold a 90% interest in Dutwa to Blackdown Resources (UK) Ltd. of the United Kingdom (Madlala, 2012; Murray, 2013).

Barrick Gold Corp. of Canada (50%) and Glencore Xstrata plc of Switzerland (50%) (formerly Xstrata plc) held the Kabanga deposit in northwestern Tanzania. Resources were estimated to be 54.4 million metric tons (Mt) at a grade of 2.24% nickel; the deposit also contained cobalt, copper, and platinum (Barrick Gold Corp., 2014, p. 155).

Copper.—African Barrick Gold plc (ABG) (Barrick, 73.9%) of the United Kingdom produced more than 5,400 t of copper as a coproduct at the Bulyanhulu and the Buzwagi gold mines in 2013. Danformation Tanzania Ltd. operated a small-scale smelter in Dar es Salaam with a capacity to process about

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18,000 t/yr of ore; high-grade azurite and malachite ores were purchased from artisanal miners. Walkabout Resources Ltd. of Australia started drilling at its Kigoma project in western Tanzania in June 2013 (African Mining, 2012; Piper, 2013).

Gold.—In 2013, ABG produced 7,985 kilograms (kg) of gold at the North Mara Mine compared with 6,010 kg in 2012 because of increased ore grades and recovery rates. Production also increased at the Buzwagi Mine to 5,660 kg in 2013 from 5,156 kg in 2012. At the Bulyanhulu Mine, output decreased to 6,167 kg in 2013 from 7,346 kg in 2012. ABG and its joint-venture partner MDN Inc. of Canada produced 219 kg in 2013 at the Tulawaka Mine compared with 1,379 kg in 2012; Tulawaka's reserves were depleted in the first half of 2013 (African Barrick Gold plc, 2014, p. 16, 18, 20, 25, 27).

ABG planned to produce between 20,200 and 21,500 kg of gold at Bulyanhulu, Buzwagi, and North Mara combined in 2014. In the first half of 2014, ABG planned to start retreating tailings at Bulyanhulu and to increase output by about 1,200 kilograms per year (kg/yr). ABG also planned to complete a revised feasibility study on the Bulyanhulu Upper East Expansion in 2014. In a previous feasibility study, the expansion was planned to increase production by about 2,800 kg/yr. The remaining life of the Bulyanhulu Mine was estimated to be more than 25 years; the North Mara Mine, 10 years, and the Buzwagi Mine, 5 years (Mining Review Africa, 2013a; African Barrick Gold, 2014, p. 1, 13, 17).

In 2013, ABG updated its resource assessment for the Nyanzaga project. Resources were estimated to be 100 Mt at a grade of 1.29 grams per metric ton (g/t) gold. ABG planned to explore further at Nyanzaga in 2014 (African Barrick Gold plc, 2014, p. 24, 91).

Geita Gold Mining Ltd. (a subsidiary of AngloGold Ashanti Ltd. of South Africa) produced about 14,300 kg of gold at the Geita Mine in 2013 compared with 16,500 kg in 2012. Decreased volumes of ore milled more than offset increased ore grades; production decreased because of downtime for the replacement of the mill in early 2013 (AngloGold Ashanti Ltd., 2014, p. 48, 67–68).

Since 1998, Resolute Mining Ltd. of Australia has produced about 68,000 kg of gold at the Golden Pride Mine. Production at Golden Pride was 2,258 kg of gold in 2013; the mine's reserves were depleted in late December. In mid-2013, Golden Pride was estimated to have remaining subeconomic resources of about 23.5 Mt at a grade of 1.8 g/t gold. Resolute engaged in exploration at the Nyakafuru project in 2013, which had estimated reserves of 7.36 Mt at a grade of 1.6 g/t gold. The company hoped to identify additional reserves at Nyakafuru; production levels of more than 3,100 kg/yr during a lifetime of at least 6 to 7 years were estimated to be necessary to build a new mine (Mining Review Africa, 2013b; Resolute Mining Ltd., 2013a, p. 6–7, 13; 2013b; 2014).

Shanta Gold Ltd. of the United Kingdom started mining at the New Luika Mine in the third quarter of 2012. The company produced nearly 2,000 kg of gold in 2013; planned production for 2014 was 2,500 kg. In the fourth quarter of 2013, resources at New Luika were estimated to be 14.3 Mt at a grade of 3.22 g/t gold, of which 2.4 Mt at a grade of 6.1 g/t gold was reserves. Shanta was also considering the development of the Singida project, which had resources of 9.2 Mt at a grade of 2.9 g/t gold. The company planned to start a feasibility study of a new mine at Singida by the first half of 2014. Total production from New Luika and Singida could be about 3,900 kg/yr of gold (Shanta Gold Ltd., 2014).

Tanzanian Royalty Exploration Corp. of Canada and its joint-venture partner Stamico completed a preliminary economic assessment on a new mine at the Buckreef project in 2012. The study supported the development of a new mine that would produce an average of about 3,500 kg/yr of gold over its estimated 12-year life. Resources at Buckreef were estimated to be 47.2 Mt at a grade of 1.4 g/t gold. In 2013, Tanzanian Royalty announced plans to start mining in 2014 (Vaccaro, 2012; Tanzanian Royalty Exploration Corp., 2013, p. 5–6; 2014, p. 5).

Tanzanian Royalty was also considering the possibility of producing a total of about 2,800 kg/yr of gold at the Itetemia and the Kigosi projects. In 2013, Tanzanian Royalty received a mining license for Kigosi and announced plans to start mining in 2014 (Vaccaro, 2012; Tanzanian Royalty Exploration Corp., 2013, p. 2, 20–21; 2014, p. 2, 5).

Ruby Creek Resources Inc. of the United States held the Gold Plateau properties in southern Tanzania. The company planned to produce gold from the alluvial deposits at Gold Plateau after its processing plants were shipped to Tanzania in the second quarter of 2014. Lake Victoria Mining Company of Canada planned to engage in small-scale gold production at its Kinyambwiga project (Ruby Creek Resources Inc., 2014).

In the fourth quarter of 2013, Helio Resource Corp. of Canada engaged in drilling at its SMP property in the Lupa gold field in southwestern Tanzania. Resources at SMP were estimated to be 31.3 Mt at a grade of 1.3 g/t gold (table 3). Tembo Gold Corp. of Canada drilled at its Tembo project, which was adjacent to the Bulyanhulu Mine. Liontown Resources Ltd. of Australia started drilling at the Rupa Suguti property in 2013. Rift Valley Resources Ltd. of Australia agreed to purchase AER's 50% share in the Miyabi deposit. Brookemont Capital of Canada ceased exploration at the Handeni North project in 2013 because of its plans to focus on exploration in Canada (Helio Resource Corp., 2012; Brookemont Capital Inc., 2013).

Iron and Steel, Iron Ore, Titanium, and Vanadium.—State-owned National Development Corp. (NDC) and Sichuan Hongda Company Ltd. of China were engaged in a joint venture to develop the Liganga iron ore deposits, which also contained titanium and vanadium. Inferred resources at Liganga were estimated to be more than 1.5 billion metric tons at grades of 50% iron, 13% titanium dioxide, and 0.4% vanadium pentoxide. NDC and Sichuan Hongda planned to produce 3 million metric tons per year (Mt/yr) of iron ore for consumption in a new steel plant; steel output was likely to be 1.25 Mt/yr. The companies planned to process the iron ore to direct-reduced iron and subsequently to steel. The mine and plant were expected to start production in 2018 (Ministry of Energy and Minerals, 2005, p. 87; 2013, p. 24; Ministry of Finance, 2012, p. 77–78).

Niobium.—Panda Hill Pty Ltd. (a subsidiary of Verona Capital Pty Ltd. of Australia) held the Panda Hill carbonatite deposit, which is located 35 kilometers (km) southwest of Mbeya. In April 2013, Cradle Resources Ltd. of Australia

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purchased a 50% interest in the Panda Hill deposit. Cradle started a scoping study on a new mine at Panda Hill in July. The company was considering the production of about 9,100 t/yr of niobium pentoxide (Nb_2O_5) that would be processed into ferroniobium, which had a niobium content of about 60%. Resources at Panda Hill were estimated to be 82 Mt at a grade of 0.52% Nb_2O_5. The estimated life of the mine was more than 40 years (Cradle Resources Ltd., 2013).

Industrial Minerals

Cement.—Tanzania's cement production capacity was about 3.7 Mt/yr at the end of 2013. Tanzania Portland Cement Company Ltd. (TPCC) had cement and clinker production capacities of 1.4 Mt/yr and more than 1.15 Mt/yr, respectively, at Wazo Hill. In March 2013, TPCC announced plans to increase its cement capacity at Wazo Hill to 2.1 Mt/yr by September 2014. Tanga Cement Company Ltd. planned to increase its clinker capacity by 600,000 t/yr by the first quarter of 2015. ARM Cement of Kenya planned on opening its new plant at Tanga with a capacity of 1.2 Mt/yr of clinker and 750,000 t/yr of cement in the second half of 2014 (International Cement Review, 2013a, c; ARM Cement Ltd., 2014, p. 10).

Banco Products of India planned to open the Lake Cement plant, which had a capacity of 500,000 t/yr, in 2013. At yearend, the plant was not completed. Dangote Cement plc of Nigeria planned to complete a new plant at Mtwara in southern Tanzania with a capacity of 3 Mt/yr by the second quarter of 2015. The company planned to export its production to other countries in the East African Community, the Democratic Republic of the Congo, and Malawi (International Cement Review, 2013b, c).

Diamond.—In 2012, Petra Diamonds Ltd. of the United Kingdom reopened the open pit operations at the Williamson Mine. Petra mined 170,775 carats from open pit and alluvial operations in 2013, which was about 95% of the diamond produced in Tanzania. The company had planned to increase production to 600,000 carats per year. In 2013, Petra scaled back its expansion plans to 300,000 carats per year by 2017. Resources at Williamson were estimated to be nearly 40 million carats; the estimated remaining life of the mine was more than 50 years (Murray, 2013; Williams, 2013; Petra Diamonds Ltd., 2014, p. 1, 14).

Gemstones.—Tanzania produced a variety of gemstones that included amethyst, aquamarine, cordierite, emerald, garnet, ruby, sapphire, spinel, tanzanite, and tourmaline. Tanzanite accounted for a majority of the value of domestic gemstone mining.

Merelani, which is located near Arusha, was the world's only source of tanzanite. Artisanal and small-scale miners operated in Blocks B and D of the Merelani deposit. Kilimanjaro Mines Ltd. and Tanzanite Africa Ltd. operated medium-scale mines in Block A and the Block D Extension, respectively (table 2).

Richland Resources Ltd. of Bermuda mined tanzanite in Block C; the company also cut high-quality tanzanite at its lapidaries in Tanzania. In 2013, Richland produced 690 kg of rough tanzanite, which was an increase of 28% from 2012. Output was limited by incursions of artisanal miners from Blocks B and D that resulted in damage to equipment and infrastructure and reduced the available mining areas. The company estimated that contained resources in Block C were 19,800 kg of tanzanite at yearend; the estimated remaining life of the mine was 28 years (Richland Resources Ltd., 2014, p. 2, 5, 62).

Tsavorite, which is a green grossular garnet that obtains its color from trace amounts of chromium and vanadium, was mined near Merelani. Richland continued bulk sampling at the Lemshuku-Shamberai tsavorite project in 2013. Indicated resources at Lemshuku-Shamberai were between 0.89 million and 2.17 million cubic meters at a tsavorite grade of 1.6 carats per cubic meter. The project was located about 20 km southwest of the tanzanite mines (Richland Resources Ltd., 2014, p. 8, 62).

Graphite.—The Merelani graphite mine, which is located in Block C at Merelani, produced about 8,000 t of graphite from 1995 to 1997. In 2013, Richland was engaged in a feasibility study on reopening the mine. Resources were estimated to be 25 Mt at a grade of 6.9% graphite in 1992. Richland also had about 100,000 t of waste material from its tanzanite mining operations that contained graphite (Richland Resources Ltd., 2013).

In 2013, Kibaran Resources Ltd. of Australia estimated that resources at the Epanko project were 14.9 Mt at a grade of 10.5% graphite. The company completed a scoping study on a new mine at Epanko with positive results in July. Kibaran signed an offtake agreement with a European company to sell 10,000 t/yr of graphite for at least 10 years from Epanko depending on the success of a feasibility study. The estimated capital cost of the project was $39 million (Andrews, 2013a).

In 2013, Uranex Ltd. of Australia started a trenching program at the Nachu graphite project in southeastern Tanzania. Uranex planned to start a prefeasibility study on a new mine at Nachu in the second quarter of 2014 and a feasibility study by yearend (Andrews, 2013b).

Lime.—Tanzania's lime production increased to an estimated 120,000 t in 2013 from 85,000 t in 2012 and 50,000 t in 2011. Increased output was attributable to the opening of Neelkanth Lime Ltd.'s new plant in Tanga with a capacity of 144,000 t/yr (Neelkanth Lime Ltd., 2013).

Rare Earths.—In April 2013, Peak Resources Ltd. of Australia estimated that resources at its Ngualla rare-earth project were 195 Mt at a grade of 2.26% rare-earth oxides (REOs), which includes a high-grade bastnaesite zone with 21.6 Mt at a grade of 4.54% REOs. Peak Resources planned to complete a prefeasibility study on a new mine at Ngualla in early 2014 and a feasibility study by the end of 2014. Depending on the results of the studies, production could be 10,000 t/yr of REOs starting in late 2016. Peak Resources planned to produce about 4,800 t/yr of cerium oxide, 2,800 t/yr of lanthanum oxide, 2,100 t/yr of mixed praseodymium oxide and neodymium oxide, and 290 t/yr of heavy rare-earth oxides and yttrium oxide (Peak Resources Ltd., 2013a–c).

Montero Mining and Exploration Ltd. of Canada engaged in exploration at the Wigu Hill project near Kisaki in early 2013. At yearend, the project was on care-and-maintenance status (Montero Mining and Exploration Ltd., 2014, p. 6).

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Coal.—Intra Energy Corporation Ltd. of Australia and its joint-venture partner National Development Corp. (NDC) (owned by the Government of Tanzania) operated a coal mine at the Ngaka coal field in the Ruvumu District. Production increased in 2013; Intra Energy and NDC were producing at the rate of about 200,000 t/yr in September. The companies planned to increase production to 360,000 t/yr by the end of 2014 and to 500,000 t/yr by 2015. Coal was likely to be exported to Kenya, Malawi, and Uganda (Makene, 2013).

NDC and Sichuan Hongda planned to build a new mine at the Mchuchuma coal deposits in western Tanzania. Mining was likely to start in 2018; NDC and Sichuan Hongda planned to produce 3 Mt/yr of coal. The companies also planned to complete the 300-megawatt (MW) first phase of a coal-fired power station in 2018. About 100 MW of capacity was expected to be used by the Liganga iron ore and steel project. The 400-MW second phase of the power station was likely to be completed between 2021 and 2024, and the 300-MW third phase, between 2026 and 2028 (Ministry of Finance, 2012, p. 77–78; Ministry of Energy and Minerals, 2013, p. 24, 64).

Natural Gas.—In 2013, Orca Exploration Group Inc. produced 995 million cubic meters of natural gas from Songo Songo Island, which was nearly unchanged from that of 2012. Gas-fired power stations and TPCC's cement plant were the leading consumers of gas from Songo Songo. The capacity of Orca's gas processing plant was 1.14 billion cubic meters per year, and of the pipeline, 1.05 billion cubic meters per year. In November 2012, construction started on the expansion of the pipeline and a new processing plant. The initial capacity of the plant was likely to be 1.45 billion cubic meters per year, and the final capacity of the plant and pipeline, 2.17 billion cubic meters per year. Orca planned to utilize as much as 90% of the new plant and pipeline's final capacity (Orca Exploration Group Inc., 2014, p. 2, 8, 20).

Etablissements Maurel et Prom SA of France and its joint-venture partners operated the Mnazi Bay offshore gas project in the Rovuma Basin. Natural gas from Mnazi Bay was consumed at a power station with a capacity of 18 MW. In 2013, China National Petroleum Corp. of China was building a new 532-km pipeline from Mnazi Bay to gas-fired power stations in Dar es Salaam. The completion of the pipeline was scheduled for the end of 2014; a new gas processing plant with a capacity of 2.17 billion cubic meters per year was also under construction. Maurel et Prom and its joint-venture partners planned to produce 830 million cubic meters in 2015 and to reach the plant's full capacity in 2017. Production capacity could increase to nearly 2.8 billion cubic meters per year in 2019 (Wentworth Resources Ltd., 2014, p. 7, 9).

In 2013, BG Group plc of the United Kingdom and Ophir Energy plc of the United Kingdom drilled for natural gas in the offshore Blocks 1, 3, and 4. The companies estimated that reserves in Block 1 were about 270 billion cubic meters of natural gas; in Block 4, 150 billion cubic meters; and in Block 3, 23 billion cubic meters. Statoil ASA of Norway and Exxon Mobil Corp. of the United States estimated that reserves were between 140 billion and 170 billion cubic meters at the Zafarani-1 well and 85 billion cubic meters at the Lavani-1 well in 2013; both wells are located in the offshore Block 2 (Brower, 2013; Ophir Energy plc, 2014, p. 22–23).

BG and Statoil were considering the development of a liquefied natural gas (LNG) plant near Mtwara that would use natural gas from Blocks 1 and 2. The plant would have a capacity of 10 Mt/yr of LNG, which was equivalent to 13.8 billion cubic meters per year of natural gas. BG and Statoil could make an investment decision by late 2016; production could start in 2020 or 2021. The estimated capital cost of the project was between $10 billion and $16 billion (Brower, 2013).

Petróleo Brasileiro S.A. of Brazil and Royal Dutch Shell plc of the Netherlands explored for natural gas in offshore Blocks 5 and 6 in 2013. Ophir and Mubadala Petroleum of the United Arab Emirates explored in Block 7. A total of 17 exploration wells were expected to be drilled in Tanzanian waters between July 2013 and June 2014 (Brower, 2013).

Uranium.—Uranium One Inc. of Canada (Rosatom of Russia, 100%) was engaged in a new feasibility study on a mine at the Mkuju River project in 2013. A previous feasibility study estimated that Mkuju River could support a new uranium mine with average production of 1,900 t/yr of uranium oxide (U_3O_8) during an estimated 12-year mine life. Measured and indicated resources were 143 Mt at a grade of 0.03% U_3O_8. The Government awarded a mining license to Uranium One in April. At yearend, Uranium One was in negotiations with the Government over the terms of a mining agreement (Thompson, 2011; Murray, 2013; Uranium One Inc., 2014, p. 5, 16).

Uranex held the Manyoni deposit, which had resources of 92 Mt at a grade of 0.014% U_3O_8 and the Mkuju deposit, which had resources of 11.7 Mt at a grade of 0.024% U_3O_8. In 2013, Uranex put exploration at Manyoni and Mkuju on hold because of its plans to focus on its graphite prospects. The exploration and development of graphite deposits was less expensive compared with that of uranium deposits (Andrews, 2013b).

In March 2013, Uranium Resources plc of the United Kingdom estimated that contained resources at the Mtonya project were nearly 1,100 t of U_3O_8. East African Resources Ltd. of Australia engaged in drilling at its Mkuju South project in 2013 (Murray, 2013).

Outlook

Tanzania's production of cement, coal, diamond, and natural gas is expected to increase in the near future. Cement output is likely to increase from 2014 through 2017 because of the opening of new plants and the expansion of existing plants. Coal production is expected to increase from 2014 through 2020. Diamond production is likely to increase from 2014 through 2017. The outlook for natural gas production is to increase from 2014 through 2023. Mining of rare earths is expected to start in 2016, and iron ore, in 2018. Graphite production could also restart, and uranium production could start in the near future.

Increased gold output from the Bulyanhulu and the New Luika Mines and the opening of the Buckreef, the Kigosi, and the Singida Mines is likely to more than offset the shutdown of the Golden Pride and the Tulawaka Mines from 2015 through 2018. Gold production is likely to decrease starting in 2019 because of the closure of the Buzwagi Mine.

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TABLE 1
TANZANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
Bauxite[e]		122,920 [3]	39,000	30,000	58,000 [r]	50,000
Calcite		--	152	70 [r,e]	-- [r]	2
Cement, hydraulic	thousand metric tons	1,941	2,312	2,409	2,581	2,600 [e]
Coal, bituminous		--	179	80,710	78,672	128,920
Copper, contained in concentrates and dore		3,079	6,392	6,748	5,840	5,752
Diamond[4]	carats	181,874	80,498	28,378	127,174	179,631
Gemstones, excluding diamond:[e]						
Alexandrite	kilograms	1 [3]	-- [3]	--	--	--
Amethyst	do.	150	160	160	160	160
Aquamarine	do.	468 [3]	466 [3]	470	470	470
Emerald	do.	19 [3]	--	--	--	--
Garnet	do.	8,448 [3]	9,934 [3]	10,000	10,000	10,000
Ruby	do.	1,500	1,600	1,600	1,600	1,700
Sapphire	do.	750	800	800	800	900
Tanzanite[3]	do.	768	2,001	823	759	900
Tourmaline	do.	9,283 [3]	9,530 [3]	9,600	9,600	9,600
Other[5]	do.	1,050,000	2,620,000	1,220,000	1,210,000	1,280,000
Total[3]	do.	1,068,481	2,646,109	1,241,581	1,237,625	1,300,000
Gold	do.	39,112	39,448	42,300	40,650	43,390
Gypsum and anhydrite, crude		8,105	26,918	9,288	91,610	280,476
Kaolin		18,624	58	178	2,161 [r]	1,816
Lime[e]		30,000	30,000	50,000 [r]	85,000 [r]	120,000
Natural gas[6]	million cubic meters	668	790	869	992	995
Phosphate rock:						
Gross weight		752	17,180	18,000 [e]	19,984 [r]	20,000 [e]
P_2O_5 content		230	5,200	5,400 [e]	5,600 [r]	5,600 [e]
Salt, all types		28,444	34,455	32,297	34,016	34,032
Silver, contained in concentrates and dore	kilograms	8,231	12,470	10,399	11,227	11,014
Steel, semimanufactured		122,318	126,054	118,249	133,239	140,000
Stone, sand, and gravel:						
Aggregates		86,112	152,781	150,000 [e]	150,000 [e]	150,000 [e]
Limestone, crushed		1,284,100	1,436,600	1,972,100	1,224,475 [r]	3,899,151
Marble		2,679	1,109	1,100 [e]	2,153 [r]	10,719
Pozzolanic materials		61,501	60,320	113,489	75,193	52,349

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. -- Zero.

[1]Table includes data available through February 27, 2015.

[2]In addition to the commodities listed, smelter copper and modest quantities of crude construction materials, including brick clay, are produced, but available information is inadequate to make reliable estimates of output.

[3]Reported figure.

[4]Estimated to represent 85% gem-quality and 15% industrial-quality stones. Does not include smuggled artisanal production.

[5]Other precious and semiprecious stones produced include chrysoprase, kyanite, moonstone, opal, peridot, quartz, and spinel. Does not include smuggled artisanal production.

[6]Orca Exploration Group Inc. only; Artumas Group Inc. also produced small amounts of natural gas.

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TABLE 2
TANZANIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Tanzania Portland Cement Company Ltd. (TPCC) (Scancem International DA, 69.25%)	Plant at Wazo Hill	1,400,000.
Do.		Tanga Cement Company Ltd. [Afrisam Consortium (Pty) Ltd., 62.5%]	Plant at Tanga	1,200,000.
Do.		ARM Cement Ltd.	Plant at Dar es Salaam	750,000.
Do.		Mbeya Cement Company Ltd. (LaFarge Group, 58%)	Plant at Mbeya	350,000.
Coal, bituminous		Intra Energy Corp. Ltd and National Development Corp.	Ngaka Mine	420,000.
Copper:				
Mine		African Barrick Gold plc (Barrick Gold Corp., 73.9%)	Bulyanhulu Mine near Kahama	6,200.
Do.		do.	Buzwagi Mine	4,400.
Smelter		Danformation Tanzania Ltd.	Dar es Salaam	2,400.[e]
Diamond	carats	Williamson Diamonds Ltd. (Petra Diamonds Ltd., 75%, and Government, 25%)	Williamson Mine near Shinyanga	220,000.
Do.	do.	New Alamasi	Near Shinyanga	13,000.[e]
Do.	do.	Mwadui Mpya Pit	do.	6,000.[e]
Do.	do.	Artisanal miners	do.	NA.
Gold	kilograms	Geita Gold Mining Ltd. (AngloGold Ashanti Ltd., 100%)	Geita Mine near Nyakabale	17,000 gold.
Do.	do.	African Barrick Gold plc (ABG)	North Mara Mine in Tarime District	9,300 gold.
Do.	do.	do.	Bulyanhulu Mine near Kahama	8,600 gold.
Do.	do.	do.	Buzwagi Mine	6,200 gold.
Do.	do.	Resolute Mining Ltd.	Golden Pride Mine near Isanga[1]	4,300 gold.
Do.	do.	Shanta Gold Ltd.	New Luika Mine	2,300 gold.
Do.	do.	State Mining Co. (Stamico)	Tulawaka Mine[1]	1,200[e] gold.
Do.	do.	Artisanal miners	Mrito	NA.
Lime		Neelkanth Lime Ltd.	Plant at Tanga	144,000.
Do.		Athi River Mining Ltd. (ARM)	do.	40,000.
Natural gas	million cubic meters	Orca Exploration Group Inc.	Gasfield on Songo Songo Island	1,140.
Do.	do.	Etablissements Maurel et Prom SA, 38.22%, and Wentworth Resources Ltd., 25.4%	Gasfield at Mnazi Bay	100.
Phosphate rock		Minjingu Mines and Fertilizers Ltd. (subsidiary of Mac Group of Companies)	Mine at Minjingu	100,000.
Salt		Nyanza Mines (Tanganyika) Ltd. (subsidiary of Mac Group of Companies)	Nyanza Mines at Uvinza	60,000.
Silver	kilograms	African Barrick Gold plc (ABG)	Bulyanhulu Mine near Kahama	8,800.
Steel		Aluminum Africa Ltd.	Plant at Dar es Salaam	70,000[e] rolled.
Do.		MM Integrated Steel Mills Ltd.	do.	36,000[e] rolled.
Do.		Steel Masters Ltd.	do.	22,000 rolled.
Do.		Aluminum Africa Ltd.	do.	70,000 galvanized.
Do.		MM Integrated Steel Mills Ltd.	do.	36,000 galvanized.
Tanzanite	kilograms	Richland Resources Ltd., 50%, and State Mining Co., 50%	Mine at Merelani, Block C[2]	1,200 tanzanite.
Do.	do.	Tanzanite Africa Ltd. (IPP Media Ltd.)	Mine at Merelani, Block D Extension	NA.
Do.	do.	Kilimanjaro Mines Ltd.	Mine at Merelani, Block A	NA.
Do.	do.	Small-scale and artisanal miners	Mines at Merelani, Blocks B and D	7,500.[e]

[e]Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

[1]Not operating at the end of 2013.

[2]Formerly the graphite processing plant at Merelani operated by Phoenix Minerals Ltd.

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TABLE 3
TANZANIA: GOLD RESOURCES AND RESERVES IN 2013

Project	Major operating companies	Tonnage (million metric tons)	Grade (grams per metric ton)	Contained gold (metric tons)
Reserves:				
Bulyanhulu[1]	African Barrick Gold plc (Barrick Gold Corp., 73.9%)	37.6	7.8	292
Geita[2]	Geita Gold Mining Ltd. (AngloGold Ashanti Ltd., 100%)	36.9	3.3	121
North Mara[1]	African Barrick Gold plc	21.7	3.2	69
Buzwagi[1]	do.	24.1	1.4	35
New Luika	Shanta Gold Ltd.	2.4	6.1	15
Nyakafuru[2]	Resolute Mining Ltd.	7.4	1.6	12
Total		130.1	4.2	544
Resources:				
Bulyanhulu	African Barrick Gold plc	54.4	8.9	486
Geita	Geita Gold Mining Ltd.	110.0	3.0	332
North Mara	African Barrick Gold plc	47.7	3.2	155
Nyanzaga	do.	100.0	1.3	130
Buzwagi	do.	80.4	1.3	107
Buckreef	Tanzanian Royalty Exploration Corp.	47.2	1.4	66
SMP	Helio Resource Corp.	31.3	1.3	39
New Luika	Shanta Gold Ltd.	14.3	3.2	46
Golden Pride	Resolute Mining Ltd.	23.5	1.8	42
Nyakafuru	do.	32.7	1.0	33
Magambazi	East Africa Metals Inc.	21.9	1.4	32
Singida	Shanta Gold Ltd.	9.2	2.9	27
Golden Ridge	African Barrick Gold plc	8.6	2.8	24
Igurubi	Peak Resources Ltd.	8.0	2.8	22
Kigosi	Tanzanian Royalty Exploration Corp.	21.8	0.8	18
Miyabi	African Eagle Resources plc	12.4	1.3	16
Itetemia	Tanzanian Royalty Exploration Corp.	4.2	3.1	13
Kitongo	BrightStar Resources Ltd.	4.4	2.0	9
Luhala	Tanzanian Royalty Exploration Corp.	1.9	1.9	3
Total		634	2.5	1,600

do. Ditto.

[1]Definitions of resources and reserves are based on National Instrument 43–101, as required by Canadian securities regulatory authorities.

[2]Definitions of resources and reserves are based on the Australasian Code for the Reporting of Identified Mineral Resources and Ore Reserves issued by the Joint Committee for the Australasian Institute of Geoscientists and the Australian Mining Industry Council.

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The Mineral Industry of Tunisia

By Mowafa Taib

In 2013, Tunisia supplied phosphate rock, phosphate-based fertilizers, and modest quantities of fuel minerals to countries located mainly in Asia and Europe. The mineral industry of Tunisia was focused on mineral fuel production, phosphate rock mining, and the manufacturing of phosphate and phosphate-based fertilizers and chemicals. The list of mineral commodities produced in Tunisia in 2013 included aluminum fluoride, cement, crude oil, gypsum, iron and steel, iron ore, lime, natural gas, phosphate-based fertilizers, phosphate rock, refined petroleum products, salt, and sulfuric acid (table 1).

In 2013, Tunisia was in its third year of political transition following the "Jasmine Revolution," which started as an antigovernment protest in December 2010 that spread throughout the country and ended with the fall of the Govenment. Tension between the political parties, which were represented in a coalition Government, reached a crisis point following the assassination of two prominent politicians, one of whom was a labor union leader, in February and July. The country planned to hold parliamentary and presidential elections in 2014 (Arieff and Humud, 2014, p. 3, 5).

According to the World Bank's Doing Business indicators, Tunisia ranked 60th among 189 economies in the world in terms of the ease of doing business. The country was the leading country in North Africa and the fifth in the Middle East and North Africa region in the World Bank's Doing Business rankings (World Bank, The, 2014).

Minerals in the National Economy

The gross domestic product (GDP) of Tunisia increased in real terms at a rate of 2.3% in 2013 compared with an increase of 3.9% in 2012 and a decrease of 1.9% in 2011. Although the economy recovered from the recession of 2011 that was caused by the political and civil unrest in late 2010 and most of 2011, the growth rates of 2012 and 2013 (and the projected rate for 2014) were less than the annual rate of 5% that was reported for 2005 through 2010. The contribution of the manufacturing industries (which included the building materials, ceramic, chemical, electrical, mechanical, and textile industries) to the country's economic growth was 0.3% in 2013 compared with 0.7% in 2012. The contribution of the chemical industries, which included fertilizer manufacturing, to the country's economic growth increased to 0.1% in 2013 from –0.1% in 2012. The building materials sector's contribution to economic growth decreased to 0% in 2013 from 1.0% in 2012. The contribution of the nonmanufacturing industry, which included hydrocarbon extraction and mining, to economic growth in real terms, was –0.3% in 2013 compared with 0.1% in 2012, of which the mining sector's contribution to economic growth in 2013 decreased to 0% from 0.1% in 2012, and the hydrocarbon sector's contribution decreased to –0.3% in 2013 from 0.1% in 2012 (Central Bank of Tunisia, 2014, p. 24, 26–27).

According to the Central Bank of Tunisia, 2,700 jobs were created in the energy and mining sectors in Tunisia in 2013 compared with 5,700 jobs in 2012. Although the percentage of jobs added in the energy and mining sector decreased by 53% in 2013 compared with that of 2012, the trend was positive and represented a significant turnaround from the negative trend in job creation in the sector during 2010 and 2011 when 1,700 jobs and 1,500 jobs, respectively, were lost. The manufacturing industries also provided about 28,300 additional jobs in 2013 compared with 30,000 additional jobs in 2012 and a loss of 25,500 jobs in 2011 (Central Bank of Tunisia, 2014, p. 31).

Foreign direct investment (FDI) flows from the world into Tunisia decreased to about $1.1 billion in 2013 after rebounding to $1.6 billion in 2012 following a decline of $1.2 billion in 2011. The substantial decrease of FDI flows into Tunisia was attributed to continued political unrest in the country during 2013, which created a "wait-and-see" climate for potential international investors. In 2013, 60% of FDI went to the energy sector compared with 35% in 2012. The manufacturing industries received 28% of the FDI in 2013, which was up from 21% in 2012 (Central Bank of Tunisia, 2014, p. 52; United Nations Conference on Trade and Development, 2014, p. 205).

Government Policies and Programs

Tunisia's mining code (law No. 2003–30 of April 28, 2003) regulated mining activity in the country, including prospecting, exploration, and production. Mines are state-owned properties in Tunisia, and they are regulated by the Office National des Mines (OMN) [National Office of Mines], which also conducts geologic research, prepares geologic and geophysical maps, and promotes private operations of mines. The mining code sets a tax rate of 25% on profits from mining operations but includes a 5-year tax holiday that starts at the beginning of mine production (National Office of Mines, 2014).

Crude oil and natural gas production is governed by the hydrocarbons code (law No. 99–93 of August 17, 1999) and its supplement (law No. 2002–23 of February 2002). The hydrocarbons code allows 1 year for prospecting, a maximum of 5 years for exploration, and 30 years for production. The law reduces the tax rate to 50% from 75% if the state oil company of Tunisia—Entreprise Tunisienne d'Activités Pétrolières (ETAP)—holds a 40% share of the concession (Entreprise Tunisienne d'Activités Pétrolières, 2014).

Production

In 2013, phosphate rock production increased by 19%; white cement, by 18%; and iron ore, by 9%. Gypsum output decreased by 19%; lime, by 14%; and crude oil, by 10%. The performance of the fertilizer manufacturing sector was mixed, with production increasing for diammonium phosphate

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and hyperphosphate and decreasing for ammonium nitrate, compound fertilizers, and dicalcium sulfate. Data on mineral production are in table 1.

Structure of the Mineral Industry

Government-owned Compagnie des Phosphates de Gafsa (CPG) carried out all phosphate mining and fertilizer manufacturing activities in Tunisia. CPG had the capacity to produce phosphate rock from eight open-cast mines, most of which are located in Gafsa Governorate. CPG operated 11 phosphate rock washing plants, including 4 at Al-Mitlawi, 3 at M'dhilla, and 1 each at Kef Eddour, Oum El Araies, and Redeyef. Group Chimique Tunisien (GCT), which had merged with CPG in 1996, produced phosphate-based fertilizers. GCT owned four industrial sites, which are located at Gabes, M'dhilla, Sfax, and Skhira.

Tunisian Indian Fertilizers S.A. (TIFERT) was a joint venture of CPG and GCT (35% interest each) and Coromandel International Ltd. (CFL) and Gujarat State Fertilisers and Chemicals Ltd. (GSFC) (both of India; 15% interest each). Much of Tunisia's cement production was carried out by private companies, which included domestic as well as Italian, Portuguese, and Spanish companies. State-owned Société Tunisienne de Sidérurgie [Tunisian Steel Manufacturing Co.], which was also known as El-Fouladh, was the sole steel billet producer in the country. Privately owned steel mills produced rebar (table 2) (Arab Fertilizers Association, 2014, p. 42–43).

Mineral Trade

In 2013, Tunisian trade increased in value by about 4.3% for exports and 3.5% for imports compared with those of 2012. Hydrocarbon exports accounted for 15% of the total exports, and mineral commodity exports, including phosphate rock and phosphate-based products, accounted for 6% of the country's total exports. The value of the mining exports, including phosphate rock, phosphate-based fertilizers, and chemicals, in 2013, was similar to that of 2012 but remained 23.2% less than the value of mining products exports in 2010. The reason for the stagnation in the sector in 2013 was attributed to the ongoing societal tension, which brought about disturbances at phosphate rock production sites and transportation routes. In terms of tonnage, exports of phosphate rock and phosphate-based products increased by 13.3% in 2013 compared with those of 2012. The increase in the tonnage of exports of phosphate rock and phosphate-based products helped substantially in offsetting the negative effects of the decreases in the prices of phosphate products on the international market, which was 17.6% for diammonium phosphate and 20.3% for phosphate rock (Central Bank of Tunisia, 2014, p. 46).

Exports of energy and petroleum products decreased in value by about 5.4% compared with those of 2012. The decrease in the value of hydrocarbon exports was attributed to the decreases in the volume of exports of crude oil by 3.1% and refined products exports by 9.9%. Imports of coke, crude oil, natural gas, and refined petroleum products, which made up about 17% of total imports in 2012, increased in value by 33.4% compared with those of 2011 (Central Bank of Tunisia, 2014, p. 45–46).

Commodity Review

Metals

Lead and Zinc.—A 50–50 joint venture of Celamin Holdings N.L. of Australia and Tunisian Mining Services S.A. (TMS) was created to remediate four old lead and zinc mines, produce lead and zinc from dumps and tailings at the sites, and perform an environmental cleanup for those sites. Celamin, which was conducting a feasibility study for the project in 2013, expected that the project would have the potential to produce between 2.5 and 3.0 million metric tons (Mt) grading between 2.4% and 2.8% lead and between 2.6% and 3.0% zinc. The joint venture was also awarded three exploration permits in northern Tunisia in areas with existing lead and zinc mineralization with the purpose of developing lead and zinc mines. Celamin reported that it was finalizing a program for the project's development (Celamin Holdings N.L., 2014c, d).

Industrial Minerals

Cement.—Carthage Cement was a publicly listed company that owned and operated the Carthage cement plant, which commenced production in October following a year-long delay owing to financial problems and a change of ownership. The Carthage cement plant was a greenfield plant built at Djebel Ressas, which is located 40 kilometers (km) southwest of the capital city of Tunis. Carthage Cement had been established by Bina Holding and Global Investment House of Kuwait (50.24% interest). The $510 million plant had the capacity to produce 2.2 million metric tons per year (Mt/yr) of cement. The Government sold its minority share in the plant through the alternative investment market of the Tunisia Stock Exchange to Riahi Group (9.20%), Naifer Group (6.75%), and individual investors (33.80%) (table 2; Carthage Cement, 2014).

Fluorspar.—Industries Chimiques du Fluor S.A. (ICF) produced 38,000 metric tons (t) of aluminum fluoride at its plant near Gabes Port in southern Tunisia. Production was slightly less than the company's annual capacity of 42,000 metric tons per year (t/yr). Almost all aluminum fluoride output was exported for use by aluminum smelters in such countries as Bahrain, Cameroon, Canada, Egypt, France, Greece, Mozambique, the Netherlands, South Africa, and Turkey. IFC consumed about 75,000 t/yr of acid-grade fluorspar, 45,000 t/yr of hydrated alumina, 55,000 t/yr of sulfuric acid, and 20,000 t/yr of oleum (or fuming sulfuric acid). The company, which also has the capacity to produce 100,000 t/yr of anhydrite, had been importing fluorspar since the closure of the Zaghouan fluorite mine in 1992 (Industries Chimiques du Fluor S.A., 2014).

Tunisia has more than 30 locations with barite and fluorite deposits that could be developed into barite and fluorite mines, including the Jebel Kohol and Zaghouan deposits in the northeast. The Zaghouan deposit produced more than 5 Mt of barite and fluorite between 1967 and 1992. Recent studies indicated the presence of substantial fluorite and barite deposits

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in the vicinity of the old Hamman Zriba Mine that holds 650,000 t of proven reserves and 2 Mt of probable reserves of ore containing 25% barite and 30% fluorite (Azizi, 2014, p. 45).

Phosphate Rock.—For the third year in a row, the country's output of phosphate rock remained less than one-half the 8.1 Mt produced in 2010. Most phosphate rock produced was used domestically to manufacture phosphate fertilizer and other phosphate-based products. Most of the phosphate rock produced was transferred to the GCT and the TIFERT fertilizer manufacturing plants to meet previously contracted delivery targets of phosphate-based fertilizer (table 1; Arab Fertilizer Association, 2014, p. 41).

Phosphoric acid production at TIFERT's Skhira plant commenced in the second quarter of 2013 after a 2-year delay because of the civil unrest. The first shipment of phosphoric acid was exported to India in July. TIFERT's plant was built alongside the existing phosphoric acid plant operated by GCT at Skhira, which is located 50 km north of the town of Gabes in mideastern Tunisia. The TIFERT plant was expected to consume 1.4 Mt/yr of phosphate rock to produce 360,000 t/yr of phosphoric acid. The entire production of the plant would be exported to India through a long-term purchasing agreement, whereas production from the GCT plant would continue to be used for phosphate fertilizer manufacturing and for export to other world markets (Duncan's Fertiliser, 2011; Pilla, 2013).

In 2013, the Bir El Afou phosphate project, which was a joint venture of Celamin (51%) and TMS (49%) was established to develop a phosphate rock mine capable of producing and exporting 1.5 Mt/yr of phosphate rock grading 32% phosphorus pentoxide (P_2O_5; after flotation) from the Bir El Afou deposit, renewed its Bir El Afou and Chaketma exploration permits for 3 more years until 2016. The Bir El Afou deposit is located in northeastern Tunisia near the Algerian border and had estimated resources of 23 to 27 Mt of phosphate rock grading 14% to 16% P_2O_5. In 2012, Celamin completed a bankable feasibility study for the project. In late 2013, Celamin withdrew from the project and transferred its assets to TMS. The company attributed its withdrawal from the Bir El Afou project to its intention to focus on the Chaketma phosphate rock project (Celamin Holdings N.L., 2014a, p. 3).

In October, Celamin created a new partnership company with TMS, Chaketma Phosphate S.A. (Celamin, 51% interest; TMS, 49% interest) that replaced the original 50–50 joint venture of the two companies. The Chaketma exploration permit covers an area of 52 square kilometers and had a target potential of 150 to 200 Mt of phosphate rock grading 17% to 22% P_2O_5. Celamin planned to complete the definitive feasibility study and develop an operation plan for the project (Celamin Holdings N.L., 2014b).

Mineral Fuels

Natural Gas and Petroleum.—Output of natural gas and crude oil decrease slightly in 2013 compared with that of 2012. Crude oil and natural gas production had been trending downward in the past 5 years, especially oil and gas output by international oil companies working in Tunisia. On the other hand, natural gas production from ETAP's concessions was trending upward, whereas production by other companies working in Tunisia decreased between 2009 and 2013. Tunisia's hydrocarbon reserves at the end of 2013 were estimated to be 430 million barrels of crude oil and 65 billion cubic meters of natural gas. In 2013, state-owned ETAP was responsible for 80% and about 66% of total crude oil (and condensate) and natural gas produced in Tunisia, respectively. The remaining hydrocarbon output was produced by international oil companies operating in Tunisia. International, local, and regional companies were conducting exploration and production activities and together held 38 exploration licenses for crude oil and natural gas in the country, including 30 onshore and 18 offshore licenses (Entreprise Tunisienne d'Activités Pétrolières, 2014, p. 21, 23).

Hydrocarbon exploration activities in 2013 included three two-dimensional (2–D) and seven three-dimensional (3–D) seismic surveys, which covered 2,688 km and 2,926 km², respectively. The 2–D surveys included the Korane-Ras, the Nadhour-Ras, and the Rihaneonshore permits, which were operated by Repsol of Spain, and the Hammamet offshore permit, which was operated by Storm Venture International of Canada. The 3–D surveys included the Borj El Khadra, the Cosmos, the Franig, the Laarich, the Mahdia, the Makhouga, and the Zaaframe permits (Entreprise Tunisienne d'Activités Pétrolières, 2014, p. 32–33).

In 2013, ETAP approved the construction of the South Tunisian Gas Pipeline (STGP) project, which included building a central processing facility at the Nawara gasfield in southern Tunisia, a 370-km-long gas pipeline with a capacity of 10 million cubic meters per day, and a natural gas treatment plant to produce liquefied petroleum gas in the Ghannouch Industrial area near Gabes. In March 2014, OMV AG of Austria, which had five exploration permits in Tunisia, agreed to invest about $650 million in the STGP project, which was expected to begin production in 2016 (Oil and Gas Journal, 2014).

Outlook

The Government is increasing production and export of phosphate rock and phosphate-based fertilizers to the levels before civil unrest. The Government set a target of 8 Mt/yr of phosphate rock production by 2016 and 12 Mt/yr by 2020 (Santos, 2014). The flow of FDI is expected to increase in 2014 following the country's planned elections, and investors are likely to remain interested in Tunisia's energy and mining sector because of the country's geographical location and its capability to produce and export industrial mineral commodities, such as aluminum fluoride, cement, phosphate fertilizers, and salt, to Asia, Europe, and other North African countries.

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TABLE 1
TUNISIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
METALS						
Iron and steel:						
Iron ore:						
Gross weight		151	180	172	223	244
Fe content[e]		79	94	90	117	127
Metal:						
Steel, crude		155	115	119	109	109
Hot-rolled		400	500	380	380	380
INDUSTRIAL MINERALS						
Cement, hydraulic:						
Portland		7,186	7,561	6,652	6,785	6,964
White		328	509	403	456	540
Total		7,514	8,070	7,055	7,241	7,504
Fertilizers:						
Ammonium nitrate		155	169	138	182	131
Compound fertilizers		28	28	17	46	13
Diammonium phosphate		1,124	1,277	560	666	824
Dicalcium phosphate		64	77	55	57	46
Hyperphosphate		7	29	23	22	32
Phosphoric acid		1,115	1,214	568	778	747
Sodium tripolyphosphate		112	144	85	116	127
Triple superphosphate		747	740	401	494	520
Fluorine, aluminum fluoride		40	40	35	38	38
Gypsum		360	435	534	776	632
Lime		366	343	282	340	293
Phosphate rock, washed, gross weight		7,409	8,149	2,479	2,762	3,283
Salt, marine		1,280	1,804	1,181	1,132	1,146
Sulfuric acid		NA	4,868	4,500	3,200 r	3,200
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross[e]	million cubic meters	3,200	3,400	3,300	3,300	3,300
Dry	do.	2,717	3,201	3,002	2,873 r	2,868
Petroleum:						
Crude	thousand 42-gallon barrels	30,295	28,762	24,820	24,400 r	22,035
Refinery products:						
Liquefied petroleum gas	do.	1,766	1,239	1,065	1,267	1,253
Gasoline	do.	1,317	448	246	225	275
Distillate fuel oil	do.	4,047	4,047	1,276	4,288	4,816
Naphtha	do.	1,499	1,500	1,288	3,058	2,969
Paraffin oil	do.	621	621	320	291	290
Residual fuel oil	do.	4,292	4,307	1,892	4,404	3,676
White spirit	do.	102	102	476	153	194
Total	do.	13,644	12,264	6,563	13,686	13,473

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do Ditto. NA Not available.

[1]Table includes data available through February 9, 2015.

[2]In addition to the commodities listed, a variety of building and construction materials (clays, sand and gravel, tile, and stone) was produced, but available information is inadaquate to make reliable estimates of output.

Source: National Institute of Statistics (Tunisia)

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TABLE 2
TUNISIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum fluoride		Industries Chimiques du Fluor (ICF)	Gabes	42
Cement:				
Portland		Ciment des Méditerranée Gafsa S.A.	Gafsa	3,000
Do.		Carthage Cement (Bina Holding and Global Investment House, 50. 24%; public stocks; 33.80% Riha Group, 9.20%; Naifer Group, 5.75%)	Djebel Ressas	2,200
Do.		Société des Ciment d'Enfidha (Cementos Portland Valderrivas, S.A., 88%)	Enfidha	1,400
Do.		Société des Ciment de Jbel Oust (Cimentos de Portugal SGPS, S.A., 100%)	Jbel Oust	1,200
Do.		Société des Ciment de Gabès (Secil-Companhia Geral de Cal e Cimento, S.A., 100%)	Gabes	1,000
Do.		Société des Ciments Artificiels Tunisiens (Colacem S.p.A., 100%)	Ben Arous	1,000
Do.		Société des Ciment d'Oum el Kélil (Government, 100%)	Le Kef	870
Do.		Les Ciment de Bizerte	Bizerte	840
White		Société Tuniso-Andalouse de Ciment Blanc S.A. (Sotacib) (Grupo Prasa, 100%)	Feriana	600
Fertilizer:				
Ammonium nitrate		Group Chimique Tunisien (GCT) (Government, 100%)	Ghannouch, near Gabes	330
Diammonium phosphate		do.	do.	1,300
Triple superphosphate		do.	M'dhilla	465
Do.		do.	Sfax	330
Gypsum		Les Plâtres Tunisiens (Knauf Gips KG)	Maknassy	100
Iron and steel:				
Iron ore		Société de Djebel Djerissa (Government, 91%)	Djerissa Mine	100
Do.		do.	Tamera-Douaria Mine	50
Steel, crude		Société Tunisienne de Sidérurgie (El-Fouladh) (Government, 91%)	El Fouladh	200
Steel, rolled, bar and rod		Intermetal S.A. (private, 100%)	Ben Arous	300
Do.		Tunisacier Steelworks (private, 100%)	Bizerte	100
Lime, hydraulic		Les Ciment de Bizerte	do.	70
Natural gas	million cubic meters	BG Group plc, 100%	Miskar field	523
Do.	do.	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 50%, and Perenco Ltd., 50%	Franig field	143,000
Do.	do.	Eni Tunisia B.V., 50%, and Entreprise Tunisienne d'Activités Pétrolières (ETAP), 50%	Oued Zar/Hammouda field	83,000
Do.	do.	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 50%; Eni Tunisia B.V., 25%; Pioneer Natural Resources Co., 20%; Talisman Energy Inc., 5%	Adam field	242,000
Do.	do.	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 55%, and Petrofac Ltd., 45%	Chergui field	244,000
Do.	do.	Eni Tunisia B.V., 50%, and Entreprise Tunisienne d'Activités Pétrolières (ETAP), 50%	Djebel Grouz field	13,000
Do.	do.	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 50%, and Perenco Ltd., 50%	Baguel/Tarfa field	13,000
Do.	do.	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 55%, and Winstar Resources Ltd., 45%	Sabria field	9,000
Do.	do.	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 50%, and British Gas Tunisia Ltd., 50%	Hasdrubal field	1,002,000
Petroleum:				
Crude	thousand 42-gallon barrels	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 50%; Eni Tunisia B.V., 25%; Pioneer Natural Resources Co., 20%; Talisman Energy Inc., 5%	Adam field	2,243
Do.	do.	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 51%, and Eni Tunisia B.V., 49%	Baraka field	519
Do.	do.	PA Resources A.B., 100%	Didon field	3,750
Do.	do.	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 50%, and Société de Recherches et d'Exploitation des Pétroles en Tunisie (SEREPT), 50%	Ashtart field	2,055
Do.	do.	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 51%, and Eni Tunisia B.V., 49%	Maamoura field	360
Do.	do.	Eni Tunisia B.V., 50%, and Entreprise Tunisienne d'Activités Pétrolières (ETAP), 50%	Oud Zar/Hammouda field	1,309
Do.	do.	British Gas Tunisia Ltd., 100%	Miskar field	1,420

See footnotes at end of table

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TABLE 2—Continued
TUNISIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum—Continued:				
Crude—Continued:	thousand 42-gallon barrels	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 51%, and Eni Tunisia B.V., 49%)	El Hajeb/Guebiba field	1,178
Do.	do.	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 50%, and OMV A.G., 50%)	Chorouq field	1,415
Do.	do.	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 51%, and Perenco Ltd., 49%	Franig and Baguel/ Tarfa fields	231
Do.	do.	Ecumed Petroleum Corp., 75%, and Entreprise Tunisienne d'Activités Pétrolières (ETAP), 25%,	Al Manzah field	720
Do.	do.	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 51%, and Thyna Petroleum Services S.A., 49%	Cercina field	560
Do.	do.	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 55%, and Tuniso-Kuwaitian Company of Petroleum, 45%	Sidi El Kilani field	345
Do.	do.	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 55%, and Société MARETAP S.A., 45%	Ezzouia field	162
Do.	do.	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 51%, and Thyna Petroleum Services S.A., 49%	El Ain/Gremda field	230
Do.	do.	Candax Energy Inc.and Ecumed Petroleum Corp., 74%, and PA Resources A.B., 24%	El Bibane field	350
Do.	do.	Winstar Resources Ltd.	Chouech Essaida field	300
Do.	do.	PA Resources A.B., 70%, and Société de Recherches et d'Exploitation des Pétroles en Tunisie (SEREPT), 30%	Douleb/Semmama field	190
Do.	do.	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 55%, and Winstar Resources Ltd., 45%	Sabria field	143
Do.	do.	do.	Rhemoura field	202
Do.	do.	Eni Tunisia B.V., 50%, and Entreprise Tunisienne d'Activités Pétrolières (ETAP), 50%	Djebel Grouz field	150
Do.	do.	Entreprise Tunisienne d'Activités Pétrolières (ETAP), 51%	Mazrane field	19
Do.	do.	Petrofac Ltd., 55%, and Entreprise Tunisienne d'Activités Pétrolières (ETAP), 45%	Cherqui field	113
Do.	do.	Winstar Resources Ltd., 100%	Sanrhar field	34
Do.	do.	do.	Ech-chouech field	10
Do.	do.	Canadax Energy Inc., 80%	Robbana field	7
Refined	do.	Société Tunisienne des Industries du Raffinage (Government, 100%)	Bizerte	12,775
Phosphate rock		Compagnie des Phosphates de Gafsa (CPG) (Government, 100%)	Kef Eddour Mine	1,500
Do.		do.	Kef Eschfaier Mine	2,300
Do.		do.	Jallabia Mining Center	1,300
Do.		do.	Metlaoui, Mzida, Redeye and Uom Laraies Mines	2,600
Phosphoric acid		Group Chimique Tunisien (GCT) (Government, 100%)	Ghannouch, near Gabes	470
Do.		do.	Skhira	375
Do.		do.	M'dhilla	183
Do.		do.	Sfax	131
Do.		Tunisian Indian Fertilizers S.A. (TIFERT) (Compagnie des Phosphates de Gafsa (CPG), 35%; Group Chimique Tunisien (GCT), 35%; Coromandel International Ltd., 15%; Gujarat State Fertilizers and Chemical Ltd., 15%)	Skhira	360
Salt		Compagnie Générale des Salines de Tunisie (COTUSAL)	Sfax and Zarzis	900
Do.		TUNISEL	Sebkhet Lasdhibet	350
Do.		SAIDA S.A.	Sebkhet Sidi El Heni	250
Sodium tripolyphosphate		Société Chimique (ALKIMIA) (Group Chimique Tunisien (GCT), 39.1%; IMER Co., 22.12%; Driss Group, 17.05%; Carte Insurance. 9.77%; Societe Tunisienne d'Engrais Chimiques S.A, 7.23%; others, 4.73%)	Gabes	200

Do., do. Ditto.

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The Mineral Industry of Uganda

By Thomas R. Yager

In 2013, the East African country of Uganda accounted for 4% of the world's mine production of pumice and pumicite. In recent years, the country also produced aggregates, brick clay, cement, refined cobalt, gold, iron ore, kaolin, refined lead, limestone, niobium (columbium), salt, steel, tantalum, tin, tungsten, and vermiculite. Other undeveloped resources included phosphate rock. Uganda was not a globally significant consumer of most minerals in 2013, although domestic consumption of pumice and pumicite was likely globally significant (Crangle, 2014).

The mineral sector of Uganda, except for the petroleum and natural gas subsector was governed by the Mining Act (2003). The petroleum and natural gas subsector was governed by the Petroleum (Exploration, Development, and Production) Bill 2012 (the Upstream Act) and the Petroleum (Refining, Gas Processing, Transportation, and Storage) Act 2012 (the Midstream Act). The Upstream Act and the Midstream Act, which replaced the Petroleum (Exploration and Production) Act of 1985, were enacted into law in March 2013 and July 2013, respectively. The laws established (a) a competitive bidding process for licenses in the upstream natural gas and petroleum subsector, (b) the Petroleum Authority to advise the Government and implement its regulations, and (c) a national oil company to manage the Government's commercial interests in natural gas and petroleum. Production-sharing agreements would have a Government interest of between 15% and 20% (Mosbacher, 2013; Wass and Musiime, 2013, p. 17–18).

The Ministry of Energy and Mineral Development was responsible for geologic mapping, issuing exploration and mining licenses, and administering the Mining Act (2003), the Midstream Act, the Upstream Act, and their accompanying regulations. In November 2012, the Government put the issuance of new mining licenses on hold because of the lack of financial and technical capacity of some license holders and the illegal issuance of some licenses (Duncan, 2013).

Minerals in the National Economy

In 2013, the manufacturing sector accounted for 7.7% of the gross domestic product, and the mining and quarrying sector, 0.3%. Petroleum products accounted for 5.5% of Uganda's total value of exports; cement, 4.3%; iron and steel, 3.9%; cobalt, 0.4%; and gold, 0.1%. All petroleum products and most gold exports were reexports. Petroleum products accounted for 22.5% of Uganda's total value of imports; iron and steel, 4.5%; nonmetallic mineral products, 2.5%; and fertilizers and crude minerals other than coal, gemstones, or petroleum, 1.3% (Uganda Bureau of Statistics, 2014, p. 200, 235, 245–246, 250–251).

Production

In 2013, vermiculite production decreased by 98%; refined gold, by an estimated 75%; cobalt metal, by 32%; tungsten, by an estimated 30%; and brick clay, by an estimated 13%. The production of aggregates increased by 437%, and cement, by 14%. Tin mining restarted in 2013 (table 1; Uganda Bureau of Statistics, 2014, p. 52, 176, 181).

Structure of the Mineral Industry

Most of Uganda's mining and mineral processing facilities were privately owned, including the cement and steel plants, the lead refinery, and the vermiculite mine. Artisanal miners produced pozzolanic materials in the Kabarole District and salt at Lake Katwe (table 2).

Commodity Review

Metals

Cobalt and Copper.—Kasese Cobalt Company Ltd. (KCCL) (MFC Industrial Ltd. of Canada, 75%) produced cobalt metal from a cobalt-rich pyrite stockpile from the Kilembe copper mine tailings near Kasese using a bioleaching and solvent extraction-electrowinning process. In 2013, production decreased to 376 metric tons (t) from 556 t in 2012 because of depletion of the stockpile (Cobalt Development Institute, 2014).

In July 2013, the Government awarded the concession for the Kilembe mines near the border of the Democratic Republic of the Congo [Congo (Kinshasa)] to Tibet Hima Industry Company Ltd. of China. The mines were abandoned in the 1980s because of lower copper prices on the global market and political instability. Tibet Hima and its joint-venture partners planned to invest about $175 million during the first 3 to 5 years of the project (Zambian Mining Magazine, 2013).

Tin.—In 2013, Starfield Metals Ltd. of Australia started mining cassiterite at its Kikagati project in southwestern Uganda. Starfield planned to produce about 390 t of tin in concentrate in fiscal year 2015 (which would run from July 1, 2014, to June 30, 2015), about 810 t in fiscal year 2016, about 920 t in fiscal 2017, and about 960 t in fiscal year 2018. The company also planned to start work on a resource estimate by November 2014 (Starfield Metals Ltd., 2013).

Tungsten.—In 2012, Krone Uganda Ltd. mined wolframite at the Bjordal Mines in western Uganda. The Bjordal Mines had a capacity of about 240 metric tons per year (t/yr) of wolframite, which had tungsten content of between 120 t/yr and 130 t/yr. Krone was considering an expansion to more than 600 t/yr of wolframite. By March 2013, only small amounts of artisanal production was taking place because of an ongoing dispute about ownership of the mine. It was unclear when the expansion would take place (Krone Uganda Ltd., 2012; Mugalu, 2013).

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Industrial Minerals

Cement.—Uganda's cement production was 2.02 million metric tons (Mt) in 2013 compared with 1.78 Mt in 2012 and 1.16 Mt in 2009. Increased output in recent years was attributable to capacity expansions at Tororo Cement Industries Ltd. to 2.2 million metric tons per year (Mt/yr) from 1.1 Mt/yr, and at Hima Cement Industries Ltd., to 850,000 t/yr from 350,000 t/yr. In November 2012, DAO Group of Saudi Arabia started construction on a new plant in Baduka District with an initial capacity of about 270,000 t/yr (International Cement Review, 2013; Uganda Bureau of Statistics, 2014, p. 52).

Phosphate Rock.—In September 2013, the Government signed an agreement with Guangzhou Dongsong Energy Group of China for the development of the Sukulu phosphate rock deposit. Phosphate rock from Sukulu was expected to be consumed in the production of 300,000 t/yr of phosphate fertilizers. The Government also planned to build a sulfuric acid plant with a capacity of 200,000 t/yr. The capital costs of the project were estimated to be $560 million (Kisige, 2013).

Pumice and Pumicite.—Artisanal miners produced pozzolanic material at mines in the Kabarole District, especially in the Parishes of Bwanika and Nyantabooma in Kichwamaba Sub-County. Pozzolanic material was sold to Hima Cement for use in pozzolanic cement and to local construction companies. National production was 623,471 t in 2013 compared with 650,324 t in 2012 (Uganda Bureau of Statistics, 2014, p. 52, 176, 181).

Vermiculite.—In 2013, Gulf Industrials Ltd. of Australia produced 243 t of vermiculite at the Namekara Mine compared with 11,251 t in 2012. Mining was limited to samples for prospective buyers. Gulf put the mine on care-and-maintenance status in October 2012; the company that had exclusive purchasing rights for Namekara's vermiculite stopped purchases because of adverse economic conditions in Europe (Gulf Industrials Ltd., 2012; 2013, p. 2; 2014).

Mineral Fuels

Natural Gas and Petroleum.—China National Offshore Oil Corp. (CNOOC) of China, Total S.A. of France, and Tullow Oil plc of the United Kingdom each held a one-third share in the following exploration areas (EAs): EA–1, EA–1A, EA–2, and EA–3A on Lake Albert. Total was the operator of EA–1 and EA–1A; Tullow, of EA–2; and CNOOC, of EA–3A. In September 2013, the Government awarded CNOOC a production license for the Kingfisher oilfield in EA–3A. Production at Kingfisher was likely to be between 30,000 and 40,000 barrels per day (bbl/d), and that for all oilfields in EA–1, EA–1A, EA–2, and EA–3A, 250,000 bbl/d. The majority of the crude petroleum production at Lake Albert was expected to be exported. CNOOC could start production by 2017 or 2018 (Quinlan, 2013b).

In October 2013, the Government announced plans to build a new petroleum products refinery at Kabaale in Hoima District. The Government hoped to select a joint-venture partner to take a 60% interest in the refinery during the first half of 2014. The Government planned to start production at the refinery by 2017 or 2018. The refinery would have an initial capacity of 30,000 bbl/d and the refinery's capacity was planned to be expanded to 60,000 bbl/d. The estimated cost of the refinery, including the expansion, was $2.5 billion (Quinlan, 2013a, b).

Outlook

Uganda's mineral industry could expand in the next few years with increases in tin mining and the restart of cobalt, copper, and phosphate rock mining. The production of cement, limestone, and other construction materials is also likely to expand because of the increase in cement demand. In 2014, the growth of the mineral industry is likely to be limited by the closure of the Kasese cobalt plant.

Significant growth in the mineral industry could take place in the longer term depending on the viability of crude and refined petroleum production. High transportation costs because of long distances and poor road conditions and the inability to produce heavy-transport fuels could discourage international investment in the Kabaale refinery. The costs of the refinery and the export pipeline to the Indian Ocean also could be increased by the acidic and waxy nature of the Lake Albert crude petroleum (Quinlan, 2013a, b).

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TABLE 1
UGANDA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013[e]
Aggregate, syenitic		14,027	14,338	9,765	20,472 [r]	109,906 [3]
Cement, hydraulic		1,162,241	1,347,327	1,666,235	1,780,000 [r]	2,023,000 [3]
Clay:						
Brick[e]		52,000	54,000	62,000	54,000	47,000
Kaolin		4,721	27,237	20,883	42,886 [r]	43,875 [3]
Cobalt, refined		673	624	661 [r]	556 [r]	376 [3]
Gold:						
Mine	kilograms	1	4	1	1	--
Refined[e]	do.	-- [3]	450 [r]	150 [r]	200 [r]	50
Iron ore		972	3,795	2,134	4,431 [r]	4,500
Lead, refined[e]		800	800	800	800	800
Limestone		588,945	634,674 [r]	932,348	936,264 [r]	922,372 [3]
Niobium (columbium) and tantalum, ore and concentrate:						
Gross weight	kilograms	50	10	10 [e]	-- [r]	--
Nb content[e]	do.	7	1	1	-- [r,3]	--
Ta content[e]	do.	4	1	1	-- [r,3]	--
Pozzolanic material		440,293 [r]	446,316	690,911	650,324 [r]	623,471 [3]
Salt[e]		15,000	15,000	15,000	15,000	15,000
Steel[e]		54,000 [r]	59,000 [r]	65,000 [r]	60,000 [r]	64,000
Tin, placer		--	32	-- [r]	--	20
Tungsten, mine output, W content		9	55	10	43 [r]	30
Vermiculite		--	2,475 [r]	8,426 [r]	11,251 [r]	243 [3]

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. do. Ditto. -- Zero.

[1]Table includes data available through October 22, 2014.

[2]In addition to the commodities listed, corundum, lime, marble, sand and gravel, silica sand, and soapstone are presumably produced, but available information is inadequate to make reliable estimates of output.

[3]Reported figure.

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TABLE 2
UGANDA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Tororo Cement Industries Ltd.	Tororo	2,200,000.
Do.	Hima Cement Industries Ltd. (Bamburi Cement Ltd., 70%)	Kasese	850,000.
Cobalt, refined	Kasese Cobalt Company Ltd. (KCCL) (MFC Industrial Ltd., 75%, and Government, 25%)	Plant at Kasese[1]	1,000.
Gold:			
Mine, placer kilograms	Artisanal miners	Burama Ridge, Isingiro and Ntungamo District	NA.
Refined do.	Victoria Gold Star Ltd.	Kampala	21,000.
Lead, refined secondary	Uganda Batteries Ltd.	do.	1,000.
Niobium (columbium) and tantalum	3T Mining Ltd.	Mine at Wampewo[1]	27 tantalum[e]; 5 niobium[e].
Pozzolanic material	Artisanal miners	Kabarole District	NA.
Salt	do.	Lake Katwe	15,000.
Soapstone	African Minerals Ltd.	Moroto	NA.
Steel:[2]			
Crude	Steel Rolling Mills Ltd. (subsidiary of Alam Group Ltd.)	Jinja	72,000.
Do.	Steel Corp. of East Africa Ltd. (subsidiary of Madhvani Group)	do.	50,000.[e]
Billet	Steel Rolling Mills Ltd. (subsidiary of Alam Group Ltd.)	do.	72,000.[e]
Do.	Steel Corp. of East Africa Ltd. (subsidiary of Madhvani Group)	do.	50,000.[e]
Rolled	Steel Rolling Mills Ltd. (subsidiary of Alam Group Ltd.)	do.	72,000.[e]
Do.	Steel Corp. of East Africa Ltd. (subsidiary of Madhvani Group)	do.	30,000.
Do.	BM Technical Services Ltd.	Mbarara	20,000.
Do.	Sembule Steel Mills Ltd.	Plant at Kampala[1]	20,000.
Stone, crushed	Hima Cement Industries Ltd.	Kasese district	NA.
Do.	Kilembe Mines Ltd.	do.	NA.
Do.	Tororo Cement Industries Ltd.	Tororo district	NA.
Do.	Zzimwe Construction Ltd.	Mukono district	690,000.
Tin	Starfield Metals Ltd.	Western Region	75.[e]
Tungsten content of wolframite	Artisanal miners	Bjordal Mine in Western Region	240 wolframite; 120 tungsten.
Vermiculite	Gulf Industrials Ltd.	Mine at Namekara[1]	30,000.

[e]Estimated. Do., do. Ditto. NA Not available.

[1]Not operating at the end of 2013.

[2]In addition to its crude, billet, and rolled steel facilities, Uganda has a galvanized steel plant with a capacity of 30,000 metric tons per year.

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The Mineral Industry of Zambia

By Loyd M. Trimmer III

Copper and cobalt mining and refining were the dominant components of Zambia's mineral industry. In 2013, Zambia was estimated to rank eighth in the world in the production of copper ore and sixth in the production of cobalt ore. Zambia also was an internationally significant producer of semiprecious gemstones (Brininstool, 2015; Shedd, 2015).

Minerals in the National Economy

In 2013, Zambia's gross domestic product (GDP) (at constant 1994 prices) increased by 6.5% compared with 7.3% in 2012. The construction sector accounted for 13.4% of Zambia's real GDP compared with 12.7% in 2012. The value of the mining and quarrying sector, which accounted for 7.8% of the GDP in 2013 compared with a revised 8.0% in 2012, increased by 4.1% compared with a decrease of 2.7% in 2012. The Bank of Zambia attributed the mining and quarrying sector's expansion to an increase in existing mine production, new mine production, and the continued increase of construction activities (Bank of Zambia, 2014, p. 31–36).

Government Policies and Programs

The mining sector is regulated primarily by Act No. 7 of 2008 (the Mines and Mineral Development Act of 2008). Uranium exploration and mining are regulated by the Mines and Minerals Development (Prospecting, Mining and Milling of Uranium Ores and Other Radioactive Mineral Ores) Regulations of 2008.

The Income Tax Act (Chapter 323 of the Laws of Zambia), the Income Tax (Amendment) Act of 2008, the Income Tax (Amendment) Act No. 27 of 2009, the Mines and Minerals Development Act of 2008, and the Mines and Minerals Development (Amendment) Act of 2013, address capital allowances, mineral royalties, mining development agreements, the variable profits tax, and the windfall tax. Investment in most types of mineral operations are covered by the Zambia Development Agency Act of 2006, although minerals produced for the construction industry, such as clay, sand, and most types of stone, are excluded. The Engineering Institution of Zambia Act of 2010 requires that the Engineering Institution of Zambia register and regulate the conduct of professional engineers. The Environmental Protection and Pollution Control Act of 1990, and its 1999 amendment, address environmental issues, including those associated with the mining industry. Petroleum exploration and production are regulated by Act No. 10 of 2008 [the Petroleum (Exploration and Production) Act of 2008].

In February 2013, the Government issued increased fees for mining licenses and permits. The Minerals Development Commission was formed in May 2013 for the purpose of verifying production figures submitted by companies. The Environmental Management (Licensing) Regulations of 2013, passed in November, provided criteria, limits, guidelines, and license requirements for emissions and effluents. In December, the Government ordered emerald producers to submit mineral reports for tax purposes (Nyaungwa, 2013; Thomson Reuters, 2013; Zambian Economist, 2013; Chama, 2014).

Production

Data on estimated mineral production are in table 1. Notable increases in production were estimated for beryl, cobalt contained in concentrate, copper recovered and refined by electrowinning, emerald, and iron and steel. Notable decreases in production were estimated for refined cobalt. Cobalt and copper metal production data published by the Bank of Zambia were significantly higher than production estimates published by the Cobalt Development Institute and the International Copper Study Group (Bank of Zambia, 2014, p. 144; Cobalt Development Institute, 2014, p. 3; International Copper Study Group, 2014, p. 12).

Structure of the Mineral Industry

Many of the country's large copper mining and processing operations are located in Copperbelt Province in north-central Zambia. The Government retains minority interest in most of the large copper projects through its holding company Zambia Consolidated Copper Mines Investments Holdings Plc (ZCCM-IH). The mining sector is administered by the Geological Survey Department, the Mines Development Department, and the Mines Safety Department of the Ministry of Mines and Minerals Development. The Ministry of Commerce, Trade and Industry oversees the industrial manufacturing sector. Data on the capacity and ownership of selected mineral operations are in table 2.

Much of the mineral industry's electrical power was distributed by Copperbelt Energy Corporation Plc, which was owned by the Zambian Energy Corporation Ltd. of Ireland (52% equity interest) and ZCCM-IH (20%). Copperbelt Energy purchased the majority of its power from ZESCO Ltd., which was a Government parastatal company, but also had 80 megawatts (MW) of gas-turbine-powered generating capacity. ZESCO's 1,948.5 MW of generating capacity was powered by hydroelectric facilities. ZESCO also operated several small isolated diesel-fueled power stations (Liu, Masera, and Esser, 2013, p. 59; Copperbelt Energy Corporation PLC., 2014, p. 45).

In the past few years, domestic electric power demand has exceeded domestic supply, which adversely affected several proposed high-energy-demand mineral-processing projects in Zambia. In late 2013, electrical shortages were mitigated as Ndola Energy Company Ltd. commissioned a 50-MW heavy-fuel-oil plant and ZESCO commissioned a 150-MW hydroelectric generator, which was part of the Kariba North Bank Extension project that was expected to add 360 MW upon completion. An additional 1,150 MW of hydroelectric

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generating capacity was expected by 2018. In July, the Government approved plans to sell a 49% interest in the Indeni Oil Refinery. In August, the Government approved feasibility studies of the proposed Bwana Mukubwa oil refinery and pipeline. The Government also commissioned a 160-million-barrel fuel storage facility in Lusaka in the first phase of a construction program to build four fuel depots in the next year to address challenges in the energy sector owing to inadequate storage infrastructure (Bariyo, 2013; Greve, 2013; Sakala, 2013; Copperbelt Energy Corporation PLC, 2014, p. 13–14; Mutumweno, 2014).

In February, the Government released $120 million to Zambia Railway Ltd. (ZRL) for a 3-year rehabilitation program of freight and railways. ZRL planned to reestablish an inter-mine railway network and increase freight capacity. In December, the Tanzania-Zambia Railway Authority (TAZARA) planned to spend $177 million over 5 years to increase capacity. The railway linked Zambia's Copperbelt Province with the Tanzanian port of Dar es Salaam (Hill, 2013; Tanzania Daily News, 2013).

Mineral Trade

In 2013, the preliminary value of exports and imports was estimated to be about $10 billion and $9 billion, respectively. Exports increased by about $1 billion owing to an increase in metal exports to China, India, Japan, Switzerland, and the United Arab Emirates. The value of copper exports was estimated to be about $7 billion in 2013, when copper exports accounted for an estimated 68% of Zambia's merchandise exports. The value of exports of cobalt was estimated to be $138 million (1.3% of the preliminary value of Zambia's exports in 2013). Imports increased by about $1 billion owing to an increase in copper ore imports from the Democratic Republic of the Congo [Congo (Kinshasa)] and manufactured goods from South Africa. The value of imports of petroleum was estimated to be about $1.1 billion in 2013, when oil accounted for about 12% of Zambia's imports. The preliminary 2013 value of imports of fertilizer increased to $383 million from $304 million in 2012 (Bank of Zambia, 2014, p. 23).

Commodity Review

Metals

Cobalt and Copper.—Lubambe Copper Mine Ltd.'s rampup of the Lubambe copper mine (formerly the Konkola North Mine) continued as a shaft ore-handling system was commissioned in late 2013. The concentrator plant produced copper concentrate to be toll smelted and refined in Zambia by a third party. Production was expected to reach 45,000 metric tons per year (t/yr) of copper contained in concentrate by mid-2015, when the plant was expected to be processing 2.5 million metric tons per year (Mt/yr) of ore with an average grade of 2.3% copper. Feasibility work continued on the Lubambe extension area south of the present mine development. ZCCM-IH exercised its right to acquire up to 20% interest in the mining operation, of which 5% was free-carried interest. The joint venture of African Rainbow Minerals Ltd. of South Africa and Vale S.A. of Brazil held the remaining 80% interest in the Lubambe copper mine (African Rainbow Minerals Ltd., 2013, p. 12, 204; 2014, p. 71–72).

Four direct (or indirect) subsidiaries of China Nonferrous Mining Corporation Ltd. (CNMC) operated copper facilities in Zambia, including Chambishi Copper Smelter Co., Ltd., CNMC Luanshya Copper Mines PLC, NFC Africa Mining PLC, and Sino-Metals Leach Zambia Ltd. In 2013, NFC Africa produced 28,069 metric tons (t) of copper in concentrate from the Chambishi Main and the Chambishi West Mines and continued the development of the southeast Chambishi ore body. The southeast ore body project, which was expected to be completed in 2016, was designed to produce 63,000 t/yr of copper in concentrate. CNMC Luanshya's Baluba Center Mine produced 16,184 t of copper contained in concentrate and the Muliashi project produced 21,551 t of copper cathode. The Muliashi heap-leaching system began initial production with an output of 2,561 t by yearend. The agitation-leach and heap-leach facilities were designed to produce 40,000 t/yr of copper cathode at full capacity. In October, the company started construction of the slag copper recovery project, which was expected to begin production in late 2014 (China Nonferrous Mining Corporation Ltd., 2014, p. 27–30, 34–35).

At yearend 2013, Chambishi Copper increased the production capacity of the Chambishi copper smelter to 250,000 t/yr of blister copper through the completion of the second phase expansion. Chambishi Copper produced 201,123 t of anode (blister copper) in 2013. Sister company Sino-Metals Leach Zambia Ltd. produced 4,002 t of copper cathode at the Chambishi leach plant in 2013. Production at the Chambishi leach plant was suspended in January as the plant's electrolytic cells were overhauled. Sino-Metals Leach's Chambishi processing plant produced 195 t of copper in concentrate in 2013. The West Mine of NFC Africa halted the supply of ores in June (China Nonferrous Mining Corporation Ltd., 2014, p. 30–31, 33).

Kansanshi Mining PLC, which was a subsidiary of First Quantum Minerals Ltd. of Canada, mined 36.3 million metric tons (Mt) of ore and milled 11.1 Mt of sulfide ore, 7.68 Mt of mixed ore, and 6.66 Mt of oxide ore in 2013 compared with milling 9.25 Mt of sulfide ore, 8.56 Mt of mixed ore, and 6.21 Mt of oxide ore in 2012. The output from the Kansanshi facility in 2013 also included 106,214 t of copper contained in concentrate compared with 92,149 t of copper contained in concentrate in 2012 (First Quantum Minerals Ltd., 2014, p. 55).

In 2013, First Quantum continued work to expand the Kansanshi facility's total copper production capacity to 400,000 t/yr by 2015. First Quantum started construction of a smelter designed to process 1.2 Mt/yr of copper concentrate and to produce 300,000 t/yr of copper cathode. The increase in total copper output would include both copper cathode and copper in concentrate. The company continued exploration drilling programs at Kansanshi and completed the infill drilling program at the Sentinel project (First Quantum Minerals Ltd., 2013; 2014, p. 43–44).

In 2013, Konkola Copper Mines plc (KCM), which was a subsidiary of Vedanta Resources plc, produced 200,000 t of copper cathode compared with 209,000 t in 2012. Mining

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operations were affected by the temporary suspension at the Chingola open pit mine in January and by the temporary closure of shafts, the unavailability of equipment, and power interruptions at the Konkola Mine. In April, furnace leakage at the Nchanga smelter temporarily halted production until late May. The Konkola Deep Mine Project continued as KCM planned underground expansion after sinking a shaft (Vedanta Resources plc, 2013a, p. 5; 2013b, p. 4, 8; 2014a, p. 5; 2014b, p. 36).

Lumwana Mining Company Ltd., which was owned by Barrick Gold Corp. of Canada, operated the Lumwana copper mine. In 2013, production from Lumwana Mining's Chimiwungo open pit accounted for about 77% of the 24.2 Mt of ore that was milled and processed at the Lumwana Mine to produce about 118,000 t of copper contained in concentrate; the remainder of the ore mined came from the Malundwe pit. The ore contained cobalt, copper, gold, and uranium mineralization. Uranium in the concentrate was controlled by blending the ore to comply with agreed-to content limits for copper contained in concentrate sold to smelters. The Chimiwungo pit was scheduled to provide about 70% of the mill feed in 2014. After an exploration and delineation drilling program at Chimiwungo and Malundwe, Barrick updated the life-of-mine plan, which resulted in decreased stripping (Barrick Gold Corp., 2014, p. 18, 75, 77–79).

In 2013, Mopani Copper Mines plc produced 112,000 t of copper (which included blister copper and copper contained in concentrate) compared with 99,000 t of copper and about 100 t of cobalt (contained in concentrate and hydroxide) in 2012. Mopani also produced an additional 100,000 t of blister copper from ore obtained from other companies and traders in 2013. Decreased cobalt production was attributed to the suspension of operations at the Nkana cobalt plant. The Nkana cobalt plant upgrades were expected to increase capacity to 7,000 t/yr from 2,800 t/yr. The plant was placed on care-and-maintenance status in July 2012 owing to the lack of suitable feed and decreased world cobalt prices. The plant was expected to be operational in June 2014 (MetalBulletin, 2013; Glencore Xstrata plc, 2014, p. 14).

In 2013, Mopani continued the sinking of the 1,277-meter (m)-deep Synclinorium shaft at the Nkana Mine. Shaft completion and the initial hoisting of ore from the Nkana Synclinorium deposit was expected to begin by mid-2015. Mopani continued the refurbishment of the Mufulira smelter. More than 97% of the smelter's sulfur dioxide emissions were expected to be captured after the renovation compared with about 50% of the smelter's sulfur dioxide emissions prior to the investment (Glencore Xstrata plc, 2013; Murray & Roberts Cementation Zambia Ltd., 2013).

A number of cobalt and copper development and exploration projects in Zambia were ongoing. Enviro Processing Ltd., a wholly owned subsidiary of Berkeley Mineral Resources Plc (BMR) of the United Kingdom, continued the development of the Kabwe Lead-Zinc Recovery and Copper Processing project. The company acquired a copper cementation plant in June. The plant had a 29,200-t/yr copper-ore-processing capacity and was operational in December. The plant was expected to process concentrates and tailings to produce intermediate copper products to be sold to electrowinning plants. In October, the company submitted an Environmental Impact Assessment (EIA) for approval (Berkeley Mineral Resources Plc, 2013; 2014, p. 1, 5, 8).

In 2013, Ndola Mineral Resources Ltd., owned by a joint venture of BMR (75% interest) and Phoenix Materials Ltd. (25% free-carried interest), entered into an agreement with Phoenix to acquire stockpiles held at Ndola. The stockpiles of copper ore and tailings material were planned to be delivered to Enviro Processing's processing plant at Kabwe. In March, BMR entered into a joint-venture agreement with Bwana Mkubwa Consortium to acquire a small-scale mining license for the Bwana Mkubwa Mine site. The site hosts stockpiles estimated to contain 2 Mt of copper ore and tailings (Berkeley Mineral Resources Plc, 2014, p. 5).

In 2013, First Quantum released a mineral resource estimate of 1.03 billion metric tons at a grade of 0.51% copper for the Sentinel project. Kalumbila Minerals Ltd., which was a subsidiary of First Quantum, continued construction of the $2 billion Sentinel Mine, which was expected to be completed in late 2014. The Sentinel Mine was designed to mill and process 55 Mt/yr of ore and was expected to produce about 270,000 t/yr of copper in concentrate (First Quantum Minerals Ltd., 2014, p. 18, 44).

Blackthorn Resources Ltd. of Australia continued the development of the Kitumba prospect, part of the Mumbwa project. In April, Blackthorn announced an updated mineral resource estimate (indicated and inferred) of 108.9 Mt with a grade of 1.09% copper (0.5% copper cutoff grade) for the Kitumba prospect. In September, a prefeasibility study for the development of the prospect recommended an underground operation with a flotation and solvent extraction and electrowinning plant (Blackthorn Resources Ltd., 2013, p. 1, 6).

In 2013, Caledonia Mining Corp. of Canada searched for other parties in Zambia to operate the Nama cobalt-copper prospect. A preliminary technical study found that the surface leaching of copper would require the additional stripping of waste rock. The company awaited the approval of an EIA (Caledonia Mining Corp., 2014, p. 17).

Mwombezhi Resources Ltd. of Zambia, in which Argonaut Resources NL of Australia's subsidiary Lumwana West Resources Ltd. was earning interest, continued to explore for copper in Northwestern Province. After completing a 23-hole, 2,838-m drilling program on the Nyungu copper prospect in 2012, Mwombezhi planned to begin three drilling programs in May 2014. The company planned a 9-hole, 3,000-m drilling program on the Nyungu Central, North, and South prospects; an 8-hole, 2,400-m drilling program on the Kavipopo prospect; and a 10-hole, 2,500-m drilling program at the West Mwombezhi prospect (Argonaut Resources NL, 2014, p. 1–3).

Other copper sector activity included that of Superleg Zambia Ltd., which planned to build a copper processing and refining plant to process waste from tailing dumps. In November, Jinchuan Group International Resources Co. Ltd. of the Cayman Islands acquired Metorex Group of South Africa. Metorex operated the Chibuluma South Mine and planned to develop the Chifupu deposit, which was expected to extend mine life by 7 years (Mulikelela, 2013a; Jinchuan Group International Resources Co. Ltd., 2014, p. 7, 21).

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Gold.—Gold recovery by Kansanshi Mining from the residue of the high-pressure leach circuit had increased in recent years. New gravity concentrators were installed in 2010. In 2013, output from the Kansanshi facility was more than the 4,200 kilograms of gold produced in 2012 (First Quantum Minerals Ltd., 2013, p. 29, 55).

In 2013, Luiri Gold Ltd. of Australia continued the development of the Luiri Hill Gold project. In October, the company received EIA approval for its proposed open pit mine and processing plant at the Dunrobin prospect. The company completed a feasibility study of the Dunrobin prospect and began development late in December. The company also completed a scoping study for the development of the Matala prospect. In December 2013, Luiri Gold sold 75% interest in the Luiri Hill gold project to Bamboo Rock Ltd. of South Africa. In 2012, Luiri Gold announced an initial measured resource estimate for the Dunrobin prospect of 978,000 t at a grade of 2.6 grams per metric ton (g/t) gold and indicated and inferred resources of 1.8 Mt at a grade of 1.9 g/t gold (using a cutoff grade of 1 g/t gold) (Luiri Gold Ltd., 2014, p. 4–5).

Lead and Zinc.—In 2013, Enviro Processing Ltd. continued the development of the Kabwe Lead-Zinc Recovery and Copper Processing project tailings project after acquiring area surface and underground assets in 2012. A feasibility study released in August estimated the combined surface assets to contain 6.4 Mt of 5.50% zinc and 5.48% lead, which included a 2.6-Mt central leachplant stockpile estimated to contain 8.71% lead and 3.88% zinc; a 573,000-t washplant stockpile estimated to contain 10.66% zinc and 7.21% lead; Imperial smelter slag and Waelz furnace slag stockpiles; pyrite tailings; and mixed leachplant stockpiles. The company planned to use a mobile gravity separation and leachplant to begin processing the washplant tailings stockpile. Development was halted until the company's EIA was approved. The Kabwe site also hosted ore bodies that contain an estimated 51 Mt of ore at a combined grade of 4.01% lead and zinc. In 2012, BMR and Yunnan Xiangyun Feilong Nonferrous Metal Co. of China signed a memorandum of agreement to form a joint venture to recover lead and zinc from the Kabwe stockpiles (Ascot Group Ltd., 2013, p. 7– 8, 16; Berkeley Mineral Resources Plc, 2014, p. 1, 3–4, 6).

Manganese.—Manganese ore was produced primarily by small-scale operations near Mansa in Luapula Province and Mkushi in Central Province. In 2013, Kaboko Mining Ltd. of Australia began mining operations at the Mansa project and continued the exploration and development of the Emmanuel project. After acquiring a processing plant in April, Kaboko completed its scoping study of the Mansa project in May. Production of ore at Mansa began in June. The project was expected to reach production of 120,000 t/yr of manganese ore by early 2014. In January, Kaboko reached an agreement to supply ore to Noble Resources International Pte. Ltd., a wholly owned subsidiary of Noble Group Ltd. By yearend, Kaboko had supplied 2,000 t of manganese ore to Noble. Kaboko continued exploration at the Emmanuel project (which included the Brunelli prospect, the Chowa Mine prospect, and the Kapumba prospect), the Kanona project, and the Northern Manganese project (formerly the Peco project) near Mansa (Kaboko Mining Ltd., 2013a, p. 2–4, 7–11; 2013b).

Zamanco Minerals Ltd. of Australia (formerly Atticus Resources Ltd.) continued to develop the Serenje manganese project, which was a 56,000-t/yr manganese smelter. Zamanco had completed a scoping study and awaited EIA approval. In 2013, Zamanco continued exploration work on the Nkundalia and Chinali prospect (Zamanco Minerals Ltd., 2013).

Nickel.—First Quantum continued exploration of the Trident project, which included the Enterprise nickel sulfide prospect and the Sentinel copper prospect. First Quantum planned to develop a 4-Mt/yr-capacity ore-processing facility at the Sentinel copper plant to process nickel ore from the Enterprise Mine, which initially was expected to produce 38,000 t/yr of nickel in concentrate. First Quantum released a mineral resource estimate of 40.1 Mt at a grade of 1.07% nickel for the Sentinel project. The processing plant was designed to process copper ore and nickel ore from the Sentinel Mine (First Quantum Minerals Ltd., 2014, p. 44).

In May, Albidon Ltd. was acquired by Jin Tuo Investments Ltd., which was a subsidiary of the Jinchuan Group Resources Holding Ltd. of China, which itself was a subsidiary of Jinchuan Group International Resources Co. Ltd. Albidon Ltd. had owned the Munali nickel mine, which had been placed on care-and-maintenance status (Zambia Consolidated Copper Mines Investments Holdings Plc, 2013, p. 21; 2014, p. 5).

Industrial Minerals

Cement.—In 2013, Dangote Cement Plc of Nigeria continued the construction of the 1.5-Mt/yr Ndola cement plant, which is located in the Masaiti District near Ndola. The company planned to construct another 1.5-Mt/yr plant in Lusaka after the completion of the Ndola plant. By yearend, the Ndola plant was under construction (Kalia, 2013).

Gemstones.—Kagem Mining Ltd., which was a joint venture of Hagura Mining Ltd. (75%) and the Government of Zambia (25%), operated the Kagem open pit emerald mine, and continued an underground emerald trial mining program. Kariba Minerals Ltd., which was owned by Gemfields PLC of the United Kingdom (50% interest) and ZCCM-IH, reported recapitalization efforts at the Kariba amethyst mine. The company installed a washplant, two excavators, and a photovoltaic powerplant (Gemfields PLC, 2014).

Rare Earths.—In 2013, Fisherman Mining Ltd., which was a subsidiary of African Consolidated Resources plc of the United Kingdom, continued the development of the Nkombwa Hill project. In January 2013, Zambia's Ministry of Mines and Mineral Development confirmed Fisherman Mining Ltd. as the sole holder of the disputed Nkombwa project license. Galileo Resources Plc of the United Kingdom elected not to pursue an option to acquire Rare Earth International Ltd.'s (REI's) interest in the joint-venture project to explore the Nkombwa Hill carbonatite for rare earths (African Consolidated Resources plc, 2013a, p. 6; 2013b; Galileo Resources Plc, 2014, p. 44).

Sulfur.—In 2013, Chambishi Copper completed the second phase expansion of the Chambishi copper smelter, which increased the smelter's sulfuric acid production capacity to

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600,000 t/yr. The smelter was expected to be completed by yearend 2014. Also in 2013, First Quantum completed the expansion of the 14.5-Mt/yr oxide circuit at the Kansanshi Mine. The company deferred the completion of a 25-Mt/yr sulfide ore treatment plant until 2017 (First Quantum Minerals Ltd., 2013; 2014, p. 43–44; China Nonferrous Mining Corporation Ltd., 2014, p. 33).

Mineral Fuels and Related Materials

Coal.—In February 2013, the Government canceled Collum Coal Mining Industries Ltd.'s three mining licenses owing to safety and environmental concerns. In May, the mining licenses were issued to ZCCM-IH, which incorporated the wholly owned subsidiary Nkandabwe Coal Mine Ltd. to operate the mine. In late 2013, ZCCM-IH sought the transfer of Collum's mine assets. The Nkandabwe Mine had been placed on care-and-maintenance status (Mulikelela, 2013b; Zambia Consolidated Copper Mines Investments Holdings Plc, 2014, p. 51).

Maamba Collieries Ltd., which was owned by a consortium of Nava Bharat Proprietary Ltd. of Singapore (a subsidiary of Nava Bharat Ventures Ltd. of India) and ZCCM-IH, produced coal in 2013 and continued construction of its onsite powerplant. Rehabilitation of Maamba's facilities began in 2010 (Zambia Consolidated Copper Mines Investments Holdings Plc, 2013, p. 12–13).

Uranium.—Denison Mines Zambia Ltd., which was a subsidiary of Denison Mines Corp. of Canada, continued to explore the Mutanga project, which included the Dibwe North, the Dibwe-Mutanga corridor, and the Mutanga East deposits. In 2013, technical analysis of the Mutanga project estimated a combined measured and indicated mineral resource estimate of 10.3 Mt at a grade of 345 parts per million U_3O_8 equivalent (Denison Mines Corp., 2014, p. 11).

Outlook

Historically, Zambia's mineral industry has been dominated by the copper sector, although Zambia has many deposits and occurrences of other metals and industrial minerals, such as barite, feldspar, graphite, iron ore, kaolin, lead, silica sand, talc, and zinc. Landlocked Zambia faces several internal and external obstacles to successful diversification of its mineral production, which includes the availability of electrical energy and fuel supplies, cyclical world commodity prices, and high transportation costs.

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TABLE 1
ZAMBIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1,2]

(Metric tons unless otherwise specified)

Commodity[3]		2009	2010	2011	2012	2013
METALS						
Cobalt:						
Mine output, Co content		4,900	6,200	5,400	4,200 r	5,200
Metal[4]		1,506	5,026	5,746	5,665	5,000
Copper:[5]						
Mine output, Cu content:						
Concentration or cementation		496,000 r	527,000 r	521,000 r	517,000 r	559,000
Leaching, electrowon		141,000	145,000 r	142,000 r	178,000 r	201,000
Total		637,000 r	672,000 r	663,000 r	695,000 r	760,000
Metal, smelter, primary, includes low-grade electrowon		402,000 r	535,000 r	520,000 r	519,000 r	520,000
Refinery, primary:						
Electrowon		146,000 r	158,000 r	147,000 r	186,000 r	241,000
Other		294,000 r	370,000	370,000	344,000 r	327,000
Total		440,000 r	528,000 r	517,000 r	530,000	568,000
Gold	kilograms	3,300	3,600	3,800	4,500	4,500
Iron and steel, crude steel		10,000	40,000	50,000	50,000	55,000
Manganese:						
Gross weight		40,000	120,000	120,000	120,000	120,000
Mn content		13,000	40,000	40,000	40,000	40,000
Nickel, Ni content of concentrates		280	2,482 [4]	2,724 [4]	-- [4]	--
Silver	kilograms	6,000	6,500	6,500	6,400	6,400
INDUSTRIAL MINERALS						
Cement		880,000	1,126,728 [4]	1,200,000	1,200,000	1,200,000
Gemstones:						
Amethyst	kilograms	1,400,000	1,300,000	1,000,000	1,050,000	1,150,000
Beryl	million carats	6	13	7	10	11
Emerald	do.	11	20	14	17	19
Tourmaline	kilograms	21,000	20,000	20,000	21,000	20,000
Lime, calcined	thousand metric tons	130	140	50	200	200
Limestone:						
For cement and lime	do.	2,000	2,500	2,400	2,600	2,700
Crushed aggregate	do.	750	800	1,000	1,000	1,050
Sand and gravel, construction	do.	320	350	360	360	370
Sulfur:						
Gross weight:						
Pyrite concentrate		100,000	--	--	--	--
Sulfuric acid[6]		600,000	990,000	800,000	950,000	910,000
Sulfur content:						
Pyrite concentrate (42% S)		42,000	--	--	--	--
Sulfuric acid (32.6% S)		200,000	300,000	240,000	310,000	290,000
Total, S content		242,000 r	300,000	240,000	310,000	290,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous		200,000	200,000	220,000	200,000	200,000
Petroleum, refinery products[7]	thousand 42-gallon barrels	3,700 r	3,800 r	4,700 r	-- r	--

rRevised. do. Ditto. -- Zero.

[1]Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Table includes data available through February 25, 2014.

[3]In addition to the commodities listed, bismuth, clays, lead, palladium, platinum, and selenium may be produced, but available information is inadequate to make reliable estimates of output.

[4]Reported figure.

[5]Terms used are as defined by the International Copper Study Group.

[6]From the Chambishi and the Nkana acid recovery plants.

[7]From the U.S. Energy Information Administration.

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TABLE 2
ZAMBIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Bismuth	Chambishi Copper Smelter Company, Ltd. [China Nonferrous Metal Mining (Group) Company Ltd., 60%, and Yunnan Copper Industry (Group) Co. Ltd., 40%]	Chambishi copper smelter, 75 kilometers northwest of Ndola	NA.
Cement	Dangote Industries (Zambia) Ltd. (Dangote Cement Plc, 100%)	Ndola, Copperbelt	1,500,000.
Do.	Lafarge Cement Zambia plc (Pan African Cement Ltd.,[1] 50%, and Financiere Lafarge S.A.,[1] 34%)	Chilanga II plant, about 15 kilometers south of Lusaka	830,000.
Do.	do.	Ndola, Copperbelt	450,000.
Do.	do.	Chilanga I plant, about 15 kilometers south of Lusaka	200,000.
Do.	Scirocco Enterprises Ltd.	About 18 kilometers southwest of Lusaka	100,000.
Do.	Zambezi Portland Cement Ltd.	Ndola, Copperbelt	330,000.
Coal, bituminous	Maamba Collieries Ltd. [Nava Bharat consortium, 65%, and Zambia Consolidated Copper Mines Investments Holdings Plc (ZCCM–IH), 35%]	350 kilometers south of Lusaka in the Kanzie and the Izuma Basins	400,000.
Do.	Nkandabwe Coal Mine Ltd. [Zambia Consolidated Copper Mine Investments Holdings Plc (ZCCM–IH), 100%]	Kandabwe Mine,[2] near Sinazongwe	240,000.
Copper and cobalt:			
Ore and concentrate	Lubambe Copper Mine Ltd. [Joint venture of African Rainbow Minerals Ltd., 40%; Vale S.A., 40%; Zambia Consolidated Copper Mines Investments Holdings Plc (ZCCM–IH), 20%]	Lubambe copper mine, near Chililabombwe	2,500,000 ore, which yields about 45,000 copper in concentrate.
Do.	Jin Tuo Investments Ltd. (Jinchuan Group International Resources Co. Ltd., 100%)	Munali nickel mine,[2] about 60 kilometers south of Lusaka	1,200,000 ore, which yields about 1,700 copper and 500 cobalt joint products.
Do.	Chibuluma Mines plc [Metorex Ltd.,[3] 85%, and Zambia Consolidated Copper Mines Investments Holdings Plc (ZCCM–IH), 15%]	Chibuluma South Mine, about 12 kilometers west of Kitwe	600,000 ore, which yields about 18,000 copper in concentrate.
Do.	CNMC Luanshya Copper Mines PLC. [NFC Africa Mining plc, 80%, and Zambia Consolidated Copper Mines Investments Holdings Plc (ZCCM–IH), 20%]	Baluba Center underground mine	1,500,000 ore.
Do.	do.	Luanshya North Mine, Luanshya	4,500,000 ore.
Do.	Kansanshi Mining plc [Kansanshi Holdings Ltd.,[4] 80%, and Zambia Consolidated Copper Mines Investments Holdings Plc (ZCCM–IH), 20%]	Kansanshi Mine, north of Solwezi	12,000,000 sulfide ore; 8,800,000 oxide ore; 8,600,000 mixed ore.
Do.	Konkola Copper Mines plc [Vedanta Resources Finance Ltd., 79.4%, and Zambia Consolidated Copper Mines Investments Holdings Plc (ZCCM–IH), 20.6%]	Chingola open pit A and Nchanga open pit, Chingola	4,500,000 ore.
Do.	do.	Nchanga underground mine, Chingola	2,800,000 ore.
Do.	do.	Konkola Mine, Chililabombwe	2,400,000 ore.
Do.	do.	Fitwaola open pit, Chingola	NA.
Do.	do.	Reprocessing material from the TD3a, the TD3b, the TD5, and the TD7 tailings dams, Chingola	NA.
Do.	Lumwana Mining Company Ltd. (Barrick Gold Corp., 100%)	Lumwana Mine (Chimiwungo and Malundwe pits), 20 kilometers west of Chingola	21,000,000 ore.
Do.	Mkushi Copper Joint Venture Ltd. (Seringa Mining Ltd., 51%, and Katanga Resources Ltd., 49%)	Mkushi heap leach	NA.

See footnotes at end of table.

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TABLE 2—Continued
ZAMBIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper and cobalt—Continued:			
Ore and concentrate—Continued	Mopani Copper Mines plc [Carlisa Investments Corp.,[5] 90%, and Zambia Consolidated Copper Mines Investments Holdings Plc (ZCCM–IH), 10%]	Nkana Mine, includes the Central, the Mindola North, the Mindola Sub-Vertical, and the South Ore Body shafts for underground operations, and the Area A, the Area E, and the Mindola open pits, Southwest of Kitwe	5,500,000 ore.
Do.	do.	Mufulira Mine	2,500,000 ore.
Do.	NFC Africa Mining plc [China Nonferrous Metal Mining (Group) Company Ltd., 85%, and Zambia Consolidated Copper Mines Investments Holdings Plc (ZCCM–IH), 15%]	Chambishi Main Mine, 75 kilometers northwest of Ndola	2,145,000 ore, which yields about 50,000 copper in concentrate.
Do.	do.	Chambishi West Mine, 75 kilometers northwest of Ndola	990,000 ore.
Metal	Chambishi Metals plc [Eurasian Natural Resources Corporation PLC (ENRC), 90%, and Zambia Consolidated Copper Mines Investments Holdings Plc (ZCCM–IH, 10%]	Chambishi cobalt plant, 75 kilometers northwest of Ndola	27,000 copper cathode; 3,400 cobalt metal.
Do.	Chambishi Copper Smelter Co., Ltd. [China Nonferrous Metal Mining (Group) Company Ltd., 60%, and Yunnan Copper Industry (Group) Co. Ltd., 40%]	Chambishi copper smelter, 75 kilometers northwest of Ndola	250,000 copper anode (blister copper).
Do.	CNMC Luanshya Copper Mines PLC. (NFC Africa Mining plc, 100%)	Muliashi leach plant, Luanshya	40,000 copper cathode.
Do.	First Quantum Mining and Operations Ltd. (First Quantum Minerals Ltd., 100%)	Bwana Mkubwa solvent extraction-electrowinning plant	52,000 copper cathode.
Do.	Kansanshi Mining plc [Kansanshi Holdings Ltd.,[4] 80%, and Zambia Consolidated Copper Mines Investments Holdings Plc (ZCCM–IH), 20%]	Kansanshi high-pressure leach and solvent extraction-electrowinning plant	250,000 copper cathode.
Do.	Konkola Copper Mines plc [Vedanta Resources Finance Ltd., 79.4%, and Zambia Consolidated Copper Mines Investments Holdings Plc (ZCCM–IH), 20.6%]	Tailings leach plant, Chingola	80,000 copper cathode.
Do.	do.	Nchanga copper smelter, Chingola	311,000 copper anode (blister copper); 3,000 copper-cobalt alloy.
Do.	do.	Nkana copper refinery, Kitwe	300,000 copper cathode.
Do.	Mopani Copper Mines plc [Carlisa Investments Corp.,[5] 90%, and Zambia Consolidated Copper Mines Investments Holdings Plc (ZCCM–IH), 10%]	Mufulira West heap-leach facility	NA.
Do.	do.	Mufulira (ISASMELT) smelter	200,000 copper anode.
Do.	do.	Mufulira refinery	275,000 copper cathode.
Do.	do.	Nkana solvent extraction plant, southwest of Kitwe	15,000 copper cathode.
Do.	do.	Nkana cobalt plant,[2] southwest of Kitwe	2,800 cobalt metal.
Do.	Sable Zinc Kabwe Ltd. (Glencore International plc, 100%)	Sable copper leach and electrowinning plant, Kabwe	14,000 copper cathode; 600 cobalt carbonate.
Do.	Sino-Metals Leach Zambia Ltd. [China Nonferrous Metals Mining (Group) Company Ltd., Sino-Africa Mining Investments Ltd., NFC Africa Mining plc, and China Hainan Construction Co. Ltd.]	Chambishi	8,000 copper cathode.

See footnotes at end of table.

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TABLE 2—Continued
ZAMBIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gemstones:				
Amethyst		Kariba Minerals Ltd. [Gemfields PLC, 50% and Zambia Consolidated Mines Investments Holdings Plc (ZCCM–IH), 50%]	Kariba Mine, Mapatizya area, Kolomo District, Southern Province	1,100.
Beryl and emerald	kilograms	Kagem Mining Ltd. (Hagura Mining Ltd., 75%, and Government of Zambia, 25%)	Kagem Mine, Ndola District, Copperbelt Province	6,600.
Tourmaline		Artisanal miners	Various locations	NA.
Gold, Au content of ore	kilograms	Kansanshi Mining plc [Kansanshi Holdings Ltd.,[4] 80%, and Zambia Consolidated Copper Mines Investments Holdings Plc (ZCCM–IH), 20%]	Kansanshi Mine, north of Solwezi	4,800.
Iron and steel, crude steel		Universal Mining and Chemical Industries Ltd. (Trade Kings Group)	Kafue	100,000.
Lead, metal, secondary		Pagrik Zambia Ltd.	Lusaka	1,000.
Lime, quicklime		Ndola Lime Company Ltd. [Zambia Consolidated Copper Mines Investments Holdings Plc (ZCCM–IH), 100%]	Ndola	300,000.[6]
Manganese		Kaboko Mining Ltd.	Mansa area, Luapula Province	120,000.
Do.		Primarily small-scale miners	Mansa area, Luapula Province and Mkushi area, Central Province	120,000.
Nickel, Ni content of ore		Jin Tuo Investments Ltd. (Jinchuan Group International Resources Co. Ltd., 100%)	Munali Mine,[2] about 60 kilometers south of Lusaka	10,500.
Petroleum, refined	42-gallon barrels	Indeni Petroleum Refinery Ltd. (Government, 100%)	Indeni refinery, Ndola	10,000,000.
Sulfur:				
Pyrite ore, gross weight		Konkola Copper Mines plc [Vedanta Resources Finance Ltd., 79.4%, and Zambia Consolidated Copper Mines Investments Holdings Plc (ZCCM–IH), 20.6%]	Nampundwe Mine,[2] 48 kilometers west of Lusaka	300,000.
Sulfuric acid		do.	Nchanga acid plant	675,000.
Do.		Chambishi Copper Smelter Company, Ltd. [China Nonferrous Metal Mining (Group) Company Ltd., 60%, and Yunnan Copper Industry (Group) Co. Ltd., 40%]	Chambishi copper smelter, 75 kilometers northwest of Ndola	600,000.
Do.		First Quantum Minerals Ltd.	Bwana Mkubwa acid plant, near Ndola	350,000.

Do., do. Ditto. NA Not available.
[1]Subsidiary of Lafarge S.A.
[2]Operations suspended. Facility on care-and-maintenance status.
[3]Subsidiary of Jinchuan Group International Resources Co. Ltd.
[4]Subsidiary of First Quantum Minerals Ltd.
[5]A joint venture of Glencore International plc, 81.2%, and First Quantum Minerals Ltd., 18.8%.
[6]Plant has the capacity to produce up to 5,000 metric tons of hydrated lime (slaked) from quicklime.

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The Mineral Industry of Zimbabwe

By Philip M. Mobbs[1]

Zimbabwe's real gross domestic product (GDP) increased by an estimated 4.5% in 2013 compared with that of 2012. The provisional nominal GDP was about $13.5 billion in 2013, of which mining and quarrying accounted for 8.8%. Zimbabwe's diverse mineral output included about 9% of the world's diamond production (by volume), an estimated 7% of the world's platinum production, and about 5% of the world's palladium output (International Monetary Fund, 2014, p. 21; Kimberley Process Certification Scheme, 2014; Zimbabwe National Statistics Agency, 2014; Loferski, 2015).

The Ministry of Mines and Mining Development manages the mineral sector in accordance with the Mines and Minerals Act (chapter 21:05); the Mining (General) Regulations, 1977; and their amendments. Mining operations also are regulated by numerous other acts, amendments, regulations, statutory instruments, and general notices.

Minerals in the National Economy

Of the approximately 30 minerals and mineral-based commodities produced in Zimbabwe, diamond, gold, and platinum-group metals (PGMs) were the most economically significant. In accordance with the Minerals Marketing Corp. of Zimbabwe Act [as modified by the Minerals Marketing Corp. (Exemption) Regulations, 1983, and the Precious Stones Trade Act, 1978], state-owned Minerals Marketing Corp. of Zimbabwe (MMCZ) officially marketed much of the mineral production of Zimbabwe, excluding PGMs. Mining companies that produced PGMs shipped their concentrates and smelter matte directly to processing facilities in South Africa. Mining royalties, which were based on the value of minerals or mineral-bearing products that are shipped from the mine site, were payable to the Zimbabwe Revenue Authority.

In 2013, Fidelity Printers & Refiners (Private) Ltd., which was a subsidiary of the Reserve Bank of Zimbabwe (RBZ), restarted gold refining operations that had been suspended in 2007 when domestic gold production had decreased significantly. The Government redesignated Fidelity as the country's sole gold buyer and vacated the RBZ's monetary policy statement of February 2, 2009, which had authorized organizations that held appropriate permits to export gold (Makichi, 2013; Ndlovu, 2014).

The United States had imposed economic sanctions on certain entities and individuals in Zimbabwe in 2003 (which were updated in 2005 and 2008) owing to human rights abuses, political violence, and the undermining of democratic institutions or processes in Zimbabwe. The provision of funds, goods, or services was prohibited to several state-owned entities, such as Industrial Development Corporation of Zimbabwe Ltd., MMCZ, Zimbabwe Iron and Steel Company (Private) Ltd., Zimbabwe Mining Development Corp. (ZMDC), and their subsidiaries, including Marange Resources (Private) Ltd., Mbada Diamonds (Private) Ltd., and Sino-Zim Development (Private) Ltd. (U.S. Department of the Treasury, 2015).

Production

In 2013, production of coal, cobalt, copper, graphite, nickel, and PGMs, and the estimated production of limestone and sulfuric acid increased notably compared with that of 2012. Production volumes of chromite, diamond, and phosphate rock and the estimated production volume of coke decreased significantly in 2013 compared with those of 2012 (table 1).

Structure of the Mineral Industry

Domestic and international investment companies, domestic and international mining companies, Government-owned companies, mining cooperatives, multinational cement companies, and small-scale miners managed mineral operations in Zimbabwe in 2013. With some negotiated exceptions, ownership of mineral operations in Zimbabwe by domestic or international nonindigenous corporations or people was limited by statute. State-owned companies involved in the mineral sector included MMCZ, ZMDC and its subsidiaries, and subsidiaries of state-owned Industrial Development Corporation of Zimbabwe Ltd., which produced industrial minerals and mineral-based commodities (table 2).

Commodity Review

Metals

Copper and Nickel.—In September 2012, Bindura Nickel Corporation Ltd., which was a subsidiary of Mwana Africa plc of the United Kingdom, restarted mining operations at the Trojan Mine. The mine's surface facilities (which included milling, flotation, concentrate handling, and tailings facilities) were recommissioned in early 2013, and underground mining operations were ramped up. In 2013, milling and processing of 436,186 metric tons (t) of copper-nickel ore recovered about 4,820 t of nickel in concentrate. The nickel concentrate production was sold to Glencore Xstrata plc of the United Kingdom, formerly Glencore International plc (Mwana Africa plc, 2014, p. 13).

In October, the ore reserves of Bindura's Trojan Mine were increased to 3.17 million metric tons (Mt) at an average grade of 1.04% nickel compared with the previous estimate of 2.41 Mt of ore at an average grade of 1.07% nickel. Bindura's nickel smelter and refinery remained on care-and-maintenance status in 2013 (Mwana Africa plc, 2013, p. 11; 2014, p. 13).

In addition to mined copper-nickel ore, copper and nickel also were produced as coproducts of PGM mining by three

[1]Deceased.

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companies. The Mimosa Mine, which was operated by Mimosa Holdings (Private) Ltd. of Mauritius, produced about 2.4 Mt of ore in 2013. Exported concentrated ore contained about 2,500 t of copper and 3,170 t of nickel. The Ngezi Mine, which was operated by Zimbabwe Platinum Mines (Private) Ltd. (a subsidiary of Zimplats Holdings Ltd. of Guernsey, United Kingdom), mined 5.1 Mt of ore and produced about 3,600 t of copper and 4,850 t of nickel, which was exported in smelter matte. In 2013, Unki Mines (Private) Ltd., which was a subsidiary of Anglo American Platinum Ltd. of South Africa, milled 1.57 Mt of ore from the Unki Mine compared with 1.54 Mt of ore in 2012. Exported concentrate was smelted in South Africa and was estimated to contain about 1,600 t of copper and 1,300 t of nickel (Aquarius Platinum Ltd., 2013, p. 11; 2014, p. 12; Zimplats Holdings Ltd., 2013a, b; 2014; Anglo American Platinum Ltd., 2014, p. 154).

In 2013, RioZim Ltd. produced 3,360 t of refined copper and 2,845 t of refined nickel at the Empress Nickel Refinery from copper-nickel smelter matte imported from BCL Ltd. of Botswana, compared with 2,869 t of refined copper and 1,754 t of refined nickel in 2012. In November, RioZim commissioned a new 20-metric-ton-per-day (t/d)-capacity oxygen plant, which was expected to increase the facilities' matte throughput to 42 t/d from 34 t/d. RioZim planned to increase the plant's throughput to about 125 t/d. RioZim continued to restructure the company. The Empress Nickel Refinery and other base-metal assets were expected to be transferred to RioZim's proposed RioBaseMetals Ltd. operating subsidiary in 2014 (RioZim Ltd., 2014, p. 9, 17).

Platinum-Group Metals.—The Government announced that it expected that the three domestic PGM mining companies would establish a refinery in Zimbabwe by the end of 2014, consistent with the Government's desire to produce value-added mineral commodities in Zimbabwe instead of exporting ores and smelter matte for beneficiation. To encourage the construction of processing plants for minerals in Zimbabwe, the Government proposed to tax exports of several unprocessed minerals (including PGMs) or to ban the export of unprocessed minerals. The Chamber of Mines of Zimbabwe estimated that domestic platinum production would have to exceed about 15.55 metric tons per year (t/yr) to justify the cost to build and operate a refinery. In 2013, platinum production reached 13 t, which was an increase from an estimated 10.5 t in 2012 (table 1; Chinamasa, 2013, p. 172; Makichi, 2013; Thomson Reuters, 2014).

In 2013, the Mimosa Mine exported concentrated ore that contained about 3.4 t of platinum, 2.6 t of palladium, 467 kilograms (kg) of gold, 280 kg of rhodium, and about 400 kg of other PGMs. Mimosa Holdings was negotiating the expansion of its ownership from a joint venture of Aquarius Platinum Ltd. of Bermuda, Impala Platinum Holdings Ltd. of South Africa, and the Zvishavane Community Share Ownership Trust to include the National Indigenisation and Economic Empowerment Fund and an employee share ownership trust that was to be established. Mimosa was also engaged in ongoing discussions with the Government concerning changes to its proposed indigenization plan (Aquarius Platinum Ltd., 2013, p. 11; 2014, p. 12; Impala Platinum Holdings Ltd., 2013, p. 81).

In 2013, production from Zimplats' Ngezi Mine included ore from the Bimha Mine (Portal 4), the Mupfuti Mine (Portal 3), the Ngwarati Mine (Portal 1), and the Rukodzi Mine (Portal 2). Mining operations at Mupfuti continued to ramp up and were at about 60% of capacity. A second concentrator at Ngezi was commissioned in April 2013. The two Ngezi concentrators processed about 66% of the ore; the remainder was trucked to a concentrator at the Selous Metallurgical Complex (SMC), which was located about 77 kilometers (km) north of the Ngezi Mine. Output from all three concentrators was smelted at the SMC, and the smelter matte was exported to Impala's refinery in South Africa (Zimplats Holdings Ltd., 2013b; Impala Platinum Holdings Ltd., 2014).

In 2013, the metal content of the smelter matte was estimated to be 15 t of precious metals, which included gold, palladium, platinum, and rhodium. In early 2013, Zimplats Holdings signed a proposed indigenization implementation plan, but subsequently resumed discussions with the Minister of Youth Development, Indigenisation and Empowerment (Zimplats Holdings Ltd., 2013b, 2014).

In 2013, Unki Mines exported concentrates that contained an estimated 2.1 t of platinum, 1.4 t of palladium, 220 kg of gold, 164 kg of rhodium, and 208 kg of other PGMs. Ore reserves of the underground Unki Mine were expected to allow mining operations to continue until at least 2049 (Anglo American Platinum Ltd., 2014, p. 110, 154).

Tungsten.—Premier African Minerals Ltd. of the British Virgin Islands completed a preliminary economic assessment of its RHA Tungsten Project, which was located about 20 km southeast of Hwange. Premier proposed to start mining at RHA in 2014 and to reach steady-state production of 970 t/yr of tungsten in concentrate during the second year of mining (Premier African Minerals Ltd., 2013, p. 1–2).

Industrial Minerals

Diamond.—Several companies produced industrial diamond from unconsolidated surface sediments in the Marange diamondfield in the Chiadzwe area of eastern Zimbabwe, including Anjin Investments (Private) Ltd., Diamond Mining Corporation (Private) Ltd., Gye Nyame Resources, Marange Resources (Private) Ltd., and Mbada Mining (Private) Ltd. In 2013, Kusena Diamonds started mining operations at Marange, and Rera Diamonds initiated diamond exploration. DTZ-OZGEO (Private) Ltd. started diamond mining operations in Chimanimani.

In 2013, many of the diamond companies that worked the Marange diamondfield were adversely affected by the depletion of alluvial diamond in the surface and near-surface material that was being processed, reducing production. The companies were not equipped to process the underlying diamond-containing conglomerate. Reduced output resulted in increased labor disputes over nonpayment of salaries, reductions in the operational staffs of the mines, nonpayment of required Government fees and taxes, and the failure to start payments on a $50-million pledge to the Marange-Zimunya Community Share Ownership Trust (Financial Gazette, The, 2014).

Murowa Diamonds (Private) Ltd., which was a subsidiary of the joint venture of Rio Tinto plc of the United Kingdom and

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RioZim Ltd., recovered 410,096 carats of diamond from the Murowa Mine in 2013. Rio Tinto was unable to find a suitable buyer for its interest in the mine and subsequently suspended plans to divest its interest in the Murowa Mine (RioZim Ltd., 2014, p. 18–19).

Phosphate Rock.—In 2013, continuing financial problems associated with sanctions significantly restrained the rehabilitation of the Msasa plant of fertilizer producer Zimbabwe Phosphate Industries Ltd. and phosphate rock mining operations at Dorowa Minerals (Private) Ltd. Both companies were subsidiaries of state-owned Chemplex Corporation Limited Group (Bonga, 2013; Mhlanga, 2014).

Outlook

Zimbabwe has abundant mineral resources and a well-developed transportation system. The rehabilitation of the mining industry and the expansion of production could be a basis for the growth of Zimbabwe's GDP; however, mineral sector activities are expected to continue to be constrained by ongoing political issues, especially the implementation of the Indigenisation and Economic Empowerment Act and decreases of international mineral commodity prices. Shortages of electrical power, fuel, and skilled employees also are expected to continue to affect mineral sector operations adversely in the near term.

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TABLE 1
ZIMBABWE: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1, 2]

(Metric tons unless otherwise specified)

Commodity[3]		2009	2010	2011	2012	2013
METALS						
Chromite, gross weight		193,673 [4]	510,000	599,079 [4]	408,475 [4]	355,142 [4]
Cobalt, metal content[5]		74	79	86	88	319 [4]
Copper:						
Mine output, concentrate, Cu content		3,572 [4]	4,700	6,000	6,300	8,275 [4]
Metal, refinery output, refined/cathode, primary		4,000	4,545 [4]	4,355 [4]	2,869 [r, 4]	3,360 [4]
Gold, metal content	kilograms	4,965 [4]	9,100	12,824 [4]	14,742 [4]	14,065 [4]
Iron and steel:						
Steel, crude	thousand metric tons	14	14	15	15	15 [e]
Ferroalloys:						
Ferrochromium		72,223 [4]	146,000	140,000	137,534 [4]	129,554 [4]
Ferrosilicon chromium		603	--	--	--	-- [4]
Nickel:						
Mine output, concentrate, Ni content		4,858 [4]	6,200	7,992 [4]	7,899 [4]	14,058 [4]
Refinery output, refined metal		5,000	4,039 [4]	3,715 [4]	1,754 [r, 4]	2,845 [4]
Platinum-group metals:						
Iridium	kilograms	209 [4]	220	220	240	524 [4]
Palladium	do.	5,680	7,000	8,241 [4]	7,800 [r]	10,153 [4]
Platinum	do.	6,849 [4]	8,800	10,826 [4]	10,500 [r]	13,066 [4]
Rhodium	do.	900	900	900	990	1,146 [4]
Ruthenium	do.	650	700	700	760	1,012 [4]
Total	do.	14,300	17,600	20,900	22,900	25,900
Silver	do.	200	400	550	600	590
INDUSTRIAL MINERALS						
Asbestos		4,971 [4]	2,400	--	--	614 [4]
Cement, hydraulic	thousand metric tons	700	800	1,000	1,100	1,200
Clays, common		600	600	700	700	700
Diamond:						
Gem	carats	900,000	NA	NA	NA	NA
Industrial	do.	100,000	NA	NA	NA	NA
Total[4]	do.	963,502	8,435,244	8,502,648	12,060,163	10,411,818
Graphite		2,463 [4]	4,000	7,000	6,000	6,934 [4]
Lithium minerals, gross weight		50,000	47,000	48,000	53,000	50,000
Magnesite		449 [4]	--	--	--	-- [4]
Mica		1,000	1,000	1,000	1,000	1,000
Nitrogen, N content of ammonia		14,000	29,000	26,000	25,000	27,000
Perlite		3,000	1,000	1,000	1,000	1,000
Phosphate rock, marketable concentrate		20,000	63,000	60,000	20,000	6,100 [4]
Stone, sand and gravel:						
Granite, black		500	700	500	--	-- [4]
Limestone	thousand metric tons	40	50	50	50	55
Sulfur, byproduct acid, S content		1,000	1,000	1,000	1,000	1,100
Talc		200	--	--	--	-- [4]
Vermiculite		3,211 [4]	--	--	--	-- [4]
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous	thousand metric tons	1,750	2,668 [4]	2,562 [4]	3,500	4,980 [4]
Coke, including metallurgical	do.	43 [4]	180	240	370	200

[r]Revised. do. Ditto. NA Not available. -- Zero.

[1]Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Table includes data available through February 27, 2015.

[3]In addition to the commodities listed, secondary aluminum and lead; corundum; feldspar; such gemstones as amethyst, aquamarine, emerald, iolite, and tourmaline; kaolin; kyanite; and ores of antimony, tantalum, tin, and tungsten may be produced, but available information is inadequate to make reliable estimates of output.

[4]Reported figure.

[5]Includes metal content of cobalt compounds recovered from exported ore and smelter matte. Does not include cobalt compounds recovered from the Ngezi Mine or cobalt sulfate recovered from the Unki Mine.

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TABLE 2
ZIMBABWE: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Asbestos	African Associated Mines (Private) Ltd.	Shabanie Mine, Zvishavane	2,400,000 [1]
Do.	do.	Gaths Mine, Mashava	1,400,000 [1]
Cement:			
Clinker	Portland Holdings Ltd. [Pretoria Portland Cement Company Ltd. (PPC)]	Colleen Bawn, about 115 kilometers southeast of Bulawayo	1,000,000
Portland	Lafarge Cement Zimbabwe Ltd. (Lafarge, S.A.)	Harare	450,000
Do.	Portland Holdings Ltd. [Pretoria Portland Cement Company Ltd. (PPC)]	Bulawayo	800,000
Do.	Sino-Zimbabwe Cement Company Ltd. (China Building Material Industrial Corporation for Foreign Econo-Technical Cooperation and Industrial Development Corp.)	Gweru	300,000
Chromite	Local cooperatives and small-scale miners	Mines on the southern Great Dyke	340,000 [1]
Do.	do.	Mines on the northern Great Dyke	230,000 [1]
Do.	Zimbabwe Alloys Ltd. (Zim Alloys)	Inyala Mine	60,000 [1]
Do.	Zimbabwe Mining and Smelting Co. (Private) Ltd. (Zimasco) [Zimasco Consolidated Enterprises Ltd. (ZCE)]	Mining operations near Darwendale, Lalapanzi, Mutorashanga, Ngezi, and south of Shurugwi	300,000
Coal	Coal Brick (Private) Ltd.	Coal Brick Mine, Hwange	500,000
Do.	Coal Zimbabwe (Private) Ltd. [Steelmakers Zimbabwe (Private) Ltd.]	Chiredzi, about 130 kilometers southeast of Masvingo	1,200,000
Do.	Hwange Colliery Company Ltd. (Government, 37.07%; Messina Investments Ltd., 15.08%; Mittal Steel African Investments, 9.76%; London Register, 6.87%; National Social Security Authority, 6.16%)	3 Main Underground Mine, the Chaba open pit mine, and the JKL open pit mine, Hwange	5,000,000
Do.	Makoma Resources (Private) Ltd.	Entuba coalfields, near Hwange	2,400,000
Do.	Sengwa Colliery (Private) Ltd. (RioZim Ltd.)	Sengwa Colliery, about 200 kilometers northeast of Kadoma	5,000,000 [1]
Do.	Tulicoal (Private) Ltd. [Senzile Mining (Private) Ltd.]	do.	1,200,000 [1]
Cobalt:			
Ore, cobalt content	Bindura Nickel Corporation Ltd. (Mwana Africa plc)	Trojan Mine at Bindura and Shangani Mine,[1] about 100 kilometers northeast of Harare	800
Do.	Mimosa Holdings (Private) Ltd. (Aquarius Platinum Ltd., Impala Platinum Holdings Ltd., and Zvishavane Community Share Ownership Trust)	Mimosa Mine, east of Zvishavane	88
Do.	Unki Mines (Private) Ltd. (Anglo Platinum Ltd.)	Unki Mine, 10 kilometers northwest of Shurugwi	NA
Do.	Zimbabwe Platinum Mines (Private) Ltd. (Zimplats Holdings Ltd.)	Ngezi Mine, which includes the Ngwarati Mine (also known as Portal 1), the Rukodzi Mine (Portal 2), the Mupfuti Mine (Portal 3), and the Bimha Mine (Portal 4)	NA
Hydroxide	BSR Ltd. (Bindura Nickel Corporation Ltd., 100%)	Bindura	700 [1]
Do.	Empress Nickel Refinery (RioZim Ltd.)	Eiffle Flats, near Kadoma	NA
Coke	Hwange Coal Gasification Company (Private) Ltd. [Taiyuan Sanxing Coal Gasification Co., Hwange Colliery Company Ltd., and Stoat Mining (Private) Ltd.]	Hwange	144,000
Do.	Hwange Colliery Company Ltd. [Government, 37.07%; Messina Investments Ltd., 15.08%; Mittal Steel African Investments, 9.76%; London Register, 6.87%; National Social Security Authority, 6.16%]	do.	230,000

See footnotes at end of table.

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TABLE 2—Continued
ZIMBABWE: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper:				
Ore, copper content		Bindura Nickel Corporation Ltd. (Mwana Africa plc)	Trojan Mine at Bindura and Shangani Mine,[1] about 100 kilometers northeast of Harare	NA
Do.		Mimosa Holdings (Private) Ltd. (Aquarius Platinum Ltd., Impala Platinum Holdings Ltd., and Zvishavane Community Share Ownership Trust)	Mimosa Mine, east of Zvishavane	3,000
Do.		Unki Mines (Private) Ltd. (Anglo Platinum Ltd.)	Unki Mine, 10 kilometers northwest of Shurugwi	1,300
Do.		Zimbabwe Platinum Mines (Private) Ltd. (Zimplats Holdings Ltd.)	Ngezi Mine, which includes the Ngwarati Mine (also known as Portal 1), the Rukodzi Mine (Portal 2), the Mupfuti Mine (Portal 3), and the Bimha Mine (Portal 4)	3,600 e
Refined		Empress Nickel Refinery (RioZim Ltd.)	Eiffle Flats, near Kadoma	6,000
Diamond	carats	Anjin Investments (Private) Ltd. [Joint venture of Anhui Foreign Economic Construction Group and Matt Bronze (Private) Ltd.]	Marange deposit in the Chiadzwe area	NA [2]
Do.	do.	Diamond Mining Corporation (Private) Ltd. [Joint venture of Pure Diam and Zimbabwe Mining Development Corp. (ZMDC)]	do.	NA [2]
Do.	do.	DTZ-OZGEO (Private) Ltd. (Joint venture of Development Trust of Zimbabwe and JSC Zarubezhgeologia)	Chimanimani	NA
Do.	do.	Gye Nyame Resources [Joint venture of Zimbabwe Mining Development Corp. (ZMDC) and Bill Minerals]	Marange deposit in the Chiadzwe area	NA [2]
Do.	do.	Kusena Diamonds [Zimbabwe Mining Development Corp. (ZMDC)]	do.	NA [2,3]
Do.	do.	Marange Resources (Private) Ltd.) [Zimbabwe Mining Development Corp. (ZMDC)]	do.	NA [2]
Do.	do.	Mbada Mining (Private) Ltd. [Grandwell Holdings Ltd., Marange Resources (Private) Ltd., and Transfrontier Mining Company Ltd.]	do.	NA [2]
Do.	do.	Murowa Diamonds (Private) Ltd. (Rio Tinto plc, 77.8%, and RioZim Ltd., 22.2%)	Murowa Mine, near Zvishavane	403,000
Do.	do.	Limpopo Minerals Resources Ltd (Rani Investment LLC, 80%, and Khupukile Resources Ltd., 20%)	River Ranch Mine, near Beitbridge	NA [1,2]
Do.	do.	Sino Zimbabwe Development (Private) Ltd. [Zimbabwe Mining Development Corp. (ZMDC)]	Marange deposit in the Chiadzwe area	NA [2]
Gold				
Mine	kilograms	Artisanal miners, including small-scale miners and syndicates	Various locations	3,000 e
Do.	do.	Blanket Mine (1983) (Private) Ltd. [Caledonia Mining Corp., 49%; National Indigenisation and Economic Empowerment Fund, 16%; Fremiro, 15%; Blanket Employee Trust Services (Private) Ltd., 10%; Gwanda Community Share Ownership Trust, 10%]	Blanket Mine, about 15 kilometers west of Gwanda	1,300 e
Do.	do.	Casmyn Mining Zimbabwe (Private) Ltd. (New Dawn Mining Corp.)	Turk-Angelus Mine, 56 kilometers northeast of Bulawayo	550 e
Do.	do.	DTZ-OZGEO (Private) Ltd. (Joint venture of Development Trust of Zimbabwe and Econedra)	Placer mining operations at Penhalonga, about 15 kilometers northwest of Mutare	240 e
Do.	do.	Duration Gold Ltd. (Clarity Capital Group)	Vubachikwe Mine, near Gwanda	200 e
Do.	do.	do.	Athens Mine, Mvuma	100 e
Do.	do.	do.	Gaika Mine, Kwe Kwe	30 e
Do.	do.	Falcon Gold Zimbabwe Ltd. (New Dawn Mining Corp.)	Golden Quarry Mine, about 7 kilometers north of Shurugwi	300 e
Do.	do.	do.	Dalny Complex, about 33 kilometers northwest of Chegutu	250 e
Do.	do.	F.A. Stewart (Private) Ltd.	Jessie Mine, east of Gwanda	150 e
Do.	do.	Jena Mine (Private) Ltd. [Zimbabwe Mining Development Corp. (ZMDC)]	Jena Mine	450 e
Do.	do.	John Mack and Co.	Golden Valley Mine	500 e
Do.	do.	Matebeland Minerals (Private) Ltd.	Turk Mine	600 e

See footnotes at end of table.

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TABLE 2—Continued
ZIMBABWE: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gold—Continued:				
Mine—Continued	kilograms	Metallon Gold Zimbabwe (Private) Ltd. (Metallion Corp.)	Arcturus Mine, 32 kilometers east of Harare	500 e
Do.	do.	do.	How Mine, about 24 kilometers southeast of Bulawayo	1,300 e
Do.	do.	do.	Mazowe Mine, Mazowe	400 e
Do.	do.	do.	Redwing Mine, Penhalonga	200 e
Do.	do.	do.	Shamva Mine, Shamva	700 e
Do.	do.	Mimosa Holdings (Private) Ltd. (Aquarius Platinum Ltd., Impala Platinum Holdings Ltd., and Zvishavane Community Share Ownership Trust)	Mimosa Mine, east of Zvishavane	NA
Do.	do.	Mwana Africa plc	Freda Rebecca Mine, Bindura	3,700 e
Do.	do.	Pan Reef Mining Company (Private) Ltd.	Indarama Mine	50 e, 2
Do.	do.	RioZim Ltd.	Renco Mine, 75 kilometers south-southeast of Masvingo	1,000 e
Do.	do.	Sabi Gold Mines [Zimbabwe Mining Development Corp. (ZMDC)]	Sabi Mine	250 e
Do.		Unki Mines (Private) Ltd. (Anglo Platinum Ltd.)	Unki Mine, 10 kilometers northwest of Shurugwi	NA
Do.		Zimbabwe Platinum Mines (Private) Ltd. (Zimplats Holdings Ltd.)	Ngezi Mine, which includes the Ngwarati Mine (also known as Portal 1), the Rukodzi Mine (Portal 2), the Mupfuti Mine (Portal 3), and the Bimha Mine (Portal 4)	NA
Refined		Fidelity Printers & Refiners (Private) Ltd. (subsidiary of Reserve Bank of Zimbabwe)	Plant at Harare	NA
Graphite		Zimbabwe German Graphite Mines (Private) Ltd. [Graphite Kropmühl division of AMG Advanced Metallurgical Group N.V. and Zimbabwe Mining Development Corp. (ZMDC)]	Lynx Graphite Mine, Karoi	NA
Iron and steel:				
Ferroalloys, ferrochromium		CINA	Smelter at Gweru	5,000 e, 1
Do.		Jin An Corp. and Xin Yu Mining Corp.	do.	5,000 e, 1
Do.		Maranatha Ferrochrome (Private) Ltd.	Smelter at Eiffel Flats	28,000 1
Do.		MonaChrome	Smelter at Chegutu	5,000 e, 1
Do.		Olliken Ferro Alloys (Private) Ltd.	Smelter at Kwekwe	25,000 1
Do.		Wel Mining	Smelter at Gweru	5,000 e, 1
Do.		Zimbabwe Alloys Ltd. (Zim Alloys)	do.	45,000
Do.		Zimbabwe Mining and Smelting Co. (Private) Ltd. (Zimasco) [Zimasco Consolidated Enterprises Ltd. (ZCE)]	Smelter at Kwekwe	180,000
Iron:				
Iron ore, gross weight		NewZim Minerals Private Ltd. (Essar Africa Holdings Ltd., 80%, and Government, 20%)	Ripple Creek Mine, near Redcliff	600,000 1
Sponge iron		Steelmakers Zimbabwe (Private) Ltd. (Steelmakers Ltd.)	Masvingo	54,000
Steel:				
Crude steel		NewZim Steel Private Ltd. (Essar Africa Holdings Ltd., 53.4%, and Government, 35.6%)	Blast furnace at Redcliff, near Gweru	72,000 1, 4
Do.		Steelmakers Zimbabwe (Private) Ltd. (Steelmakers Ltd.)	Electric arc furnace at Redcliff	15,000
Rolled steel		Lancashire Steel (Private) Ltd. [Zimbabwe Iron and Steel Company (Private) Ltd. (Zisco)]	Wire rod mill at Kwekwe	120,000
Do.		Steelmakers Zimbabwe (Private) Ltd. (Steelmakers Ltd.)	Rolling mill at Redcliff	36,000
Lithium		Bikita Minerals (Private) Ltd.	Bikita Mine, 60 kilometers east of Musingo	55,000

See footnotes at end of table.

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TABLE 2—Continued
ZIMBABWE: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Nickel:			
Ore	Bindura Nickel Corporation Ltd. (Mwana Africa plc)	Trojan Mine at Bindura and Shangani Mine,[1] about 100 kilometers northeast of Harare	1,100,000 [e]
Ore, Ni content	Mimosa Holdings (Private) Ltd. (Aquarius Platinum Ltd., Impala Platinum Holdings Ltd., and Zvishavane Community Share Ownership Trust)	Mimosa Mine, east of Zvishavane	3,000
Do.	Unki Mines (Private) Ltd. (Anglo Platinum Ltd.)	Unki Mine, 10 kilometers northwest of Shurugwi	1,000
Do.	Zimbabwe Platinum Mines (Private) Ltd. (Zimplats Holdings Ltd.)	Ngezi Mine, which includes the Ngwarati Mine (also known as Portal 1), the Rukodzi Mine (Portal 2), the Mupfuti Mine (Portal 3), and the Bimha Mine (Portal 4)	4,900 [e]
Refined metal	BSR Ltd. (Bindura Nickel Corporation Ltd., 100%)	Bindura	15,600 [1]
Do.	Empress Nickel Refinery (RioZim Ltd.)	Eiffle Flats, near Kadoma	9,000
Nitrogen (ammonium nitrate)	Sable Chemical Industries Ltd. [TA Holdings Ltd., 51%; Chemplex Corporation Ltd., 36%; Yara Zimbabwe (Private) Ltd., 12%]	Electrolysis plant north of Kwekwe	240,000
Phosphate rock	Dorowa Minerals (Private) Ltd. (Chemplex Corporation Ltd.)	Dorowa Mine, 90 kilometers west of Mutare	155,000 [1]
Phosphate fertilizer	Zimbabwe Phosphate Industries (Chemplex Corporation Ltd.)	Msasa plant, Harare	NA
Platinum-group metals:			
Ore, mined	Zimbabwe Platinum Mines (Private) Ltd. (Zimplats Holdings Ltd.)	Ngezi Mine, which includes the Ngwarati Mine (also known as Portal 1), the Rukodzi Mine (Portal 2), the Mupfuti Mine (Portal 3), and the Bimha Mine (Portal 4)	5,100,000
Do.	Mimosa Holdings (Private) Ltd. (Aquarius Platinum Ltd., Impala Platinum Holdings Ltd., and Zvishavane Community Share Ownership Trust)	Mimosa Mine, east of Zvishavane	2,400,000
Do.	Unki Mines (Private) Ltd. (Anglo Platinum Ltd.)	Unki Mine, 10 kilometers northwest of Shurugwi	1,600,000
Ore, milled	Zimbabwe Platinum Mines (Private) Ltd. (Zimplats Holdings Ltd.)	Ngezi concentrator, Ngezi Mine	4,200,000
Do.	do.	Selous concentrator, Selous Metallurgical Complex	2,180,000
Do.	Mimosa Holdings (Private) Ltd. (Aquarius Platinum Ltd., Impala Platinum Holdings Ltd., and Zvishavane Community Share Ownership Trust)	Mimosa concentrator, east of Zvishavane	1,900,000
Smelter matte	Zimbabwe Platinum Mines (Private) Ltd. (Zimplats Holdings Ltd.)	Selous smelter, 100 kilometers south of Harare	72,000
Pyrite	Iron Duke Pyrites (GAT Investments (Private) Ltd.)	Iron Duke Mine	NA [1]
Vermiculite	Samrec Vermiculite Zimbabwe (Private) Ltd. (Imerys Group)	Shawa Mine, near Dorowa	39,000
Do.	Dinidza Vermiculite Mining Co. (Private) Ltd.	Dinidza Mine, near Dorowa	10,000

[e]Estimated. Do., do. Ditto. NA Not available.
[1]Operations suspended.
[2]Ownership disputed.
[3]Under development or redevelopment.
[4]Nominal capacity 1,000,000 metric tons per year. Blast furnaces awaiting refurbishment.

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The Mineral Industries of the Middle East

By Mowafa Taib, Waseem A. Abdulameer, Sinan Hastorun, Glenn J. Wallace, Philip M. Mobbs,[1] David R. Wilburn, and Thomas R. Yager

The Middle East region that is covered in this volume includes the following countries and territories: Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, the United Arab Emirates (UAE), the West Bank and Gaza Strip, and Yemen.[2] The region covers an area of about 5.7 million square kilometers or about 1.1% of the world's total surface area. In 2013, the region was home to about 230 million people, or 3.2% of the world's population (table 1).

Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE were members of the Cooperation Council for the Arab States of the Gulf, also known as the Gulf Cooperation Council (GCC). Iran, Iraq, Kuwait, Qatar, Saudi Arabia, and the UAE were members of the Organization of the Petroleum Exporting Countries (OPEC), and Bahrain, Iraq, Kuwait, Qatar, Saudi Arabia, Syria, and the UAE were members of the Organization of Arab Petroleum Exporting Countries. Israel was a member of the Organisation for Economic Co-operation and Development.

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The U.S. Geological Survey (USGS) acknowledges and expresses its sincere appreciation to the Government agencies and organizations listed below for providing mineral production statistics and basic economic data.

For mineral production statistics—

- Egypt—Arab Fertilizer Association;
- Iraq—State Company of Geological Survey and Mining (GEOSURV-IRAQ), Ministry of Industry and Minerals, and Ministry of Oil;
- Israel—Department of Quarries and Mines of the Ministry of Energy and Water Resources;
- Jordan—Department of Statistics, Ministry of Energy and Mineral Resources, and the Natural Resources Authority;
- Kuwait—Central Statistical Office of the Ministry of Planning;
- Oman—Ministry of Commerce and Industry;
- Saudi Arabia—Central Department of Statistics and Information of the Ministry of Economy and Planning, and Deputy Ministry for Mineral Resources of the Ministry of Petroleum and Mineral Resources; and
- United Arab Emirates—National Bureau of Statistics.

For basic economic and population data—

- International Monetary Fund, and
- The World Bank Group.

[1]Deceased.

[2]Turkey, which was included in the Middle East region in previous years of the Minerals Yearbook, is included in the Europe and Central Eurasia region in 2013.

General Economic Conditions

In 2013, the gross domestic product (GDP) of the Middle East region based on purchasing power parity was about $5.2 trillion, which accounted for 5.1% of the world's GDP. The rate of increase in GDP of the Middle East region was 0.9% in 2013 compared with a rate decrease of 1.1% in 2012. The growth rates for individual countries in the Middle East varied considerably. In 2013, the GDP growth rates were highest in Bahrain, Qatar, and Yemen, and lowest in Iran, Kuwait, and Syria. Syria's GDP decreased by 6.8% compared with a decrease of 28.9% in 2012 and 3.7% in 2011. Iran's GDP contracted by 1.9% compared with a 6.6% contraction in 2012 and a 4.0% expansion in 2011. Kuwait's GDP decreased by 0.4% in 2013 compared with an increase of 8.3% in 2012 and 10.2% in 2011. Qatar was the country with the fastest economic growth rate in the Middle East region between 2011 and 2013 (table 2).

The hydrocarbon industry continued to be the main driver of growth in the economies of the countries in the region, directly through the wealth it created in net petroleum exporting countries and indirectly through the infrastructure projects being built in the GCC countries and in Iran in particular, as well as through the remittances of expatriates working in the GCC net-petroleum-importing countries, such as Jordan, Lebanon, Syria, and Yemen. Production of metals and industrial minerals was an important component of the economy of Iran; metal smelting also was an important part of the nonfuel economies of Bahrain, Oman, Qatar, Saudi Arabia, and the UAE. For most of the countries of the region, the value of trade continued to be driven mainly by the exports of hydrocarbons to the world market. The economies of most of the oil-producing nations in the region were sustained by the high international market prices for crude oil during 2013.

The region's abundant supply of crude oil and natural gas and its geographic location, with easy access to ocean transportation, continued to give it a competitive advantage for developing energy-intensive mineral industries to produce aluminum, cement, crude steel, direct-reduced iron (DRI), fertilizers, petrochemicals, and rolled steel. In 2013, the Middle East was an important region for crude steel trade. Saudi Arabia, whose net imports of crude steel were 6.4 million metric tons (Mt), was the world's 5th-ranked net importer of crude steel; the UAE, whose net imports were 5.3 Mt, was the world's 6th-ranked net importer; Iraq, whose net imports of were 4.5 Mt, was the world's 9th-ranked net importer; and Iran, whose net imports were 2.7 Mt, was the world's 15th-ranked net importer. The region is expected to remain a net importer of crude steel for the next 5 years (World Steel Association, 2014, p. 25).

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In 2013, the Middle East region was a significant partner in the world's crude oil and natural gas trade; it was responsible for about 45.5% of the world's crude oil exports, 41.2% of the world's liquefied natural gas exports, and 4.1% of the world's natural gas pipeline exports. The region also held 9.3% of the world's petroleum refinery capacity and accounted for 12.9% of the world's refined petroleum product exports (BP p.l.c., 2014, p. 16, 19, 29).

Legislation

In 2013, Iran and Syria remained subject to numerous sanctions by the European Union (EU) and the United States. The United States extended Executive Orders 13574 and 13590, which authorized the implementation of additional sanctions against Iran because of suspicion about the goals of Iran's nuclear program. Additional Executive Orders issued by the President of the United States in 2012 that concerned Iranian sanctions included Executive Order 13599 of February 5, Executive Order 13606 of April 22, Executive Order 13608 of May 1, Executive Order 13622 of July 30, and Executive Order 13628 of October 9. Public Law 112–239 of January 2, 2013 [National Defense Authorization Act for Fiscal Year 2013 (NDAA–2013)], included additional sanctions that took effect in July 2013. Mineral sector activities affected by the subsection of NDAA–2013 titled the Iran Freedom and Counter-Proliferation Act of 2012 included the sale, supply, or transfer (directly or indirectly to or from Iran) of coal, graphite, precious metals, raw metals (which may include ore) or semifinished metals (such as aluminum and steel), and software for integrating industrial processes (U.S. Department of the Treasury, undated).

In Iran, to offset the increased cost of domestically produced minerals, which was attributed to the effect of inflation on the Iranian rial, several mining companies and the Ministry of Industries and Mines agreed that mineral products would be sold on the Iran Mercantile Exchange at prices determined by using the foreign currency room rate instead of the official exchange rate. The change resulted in a 15% to 20% decrease in the domestic prices of metal products and petrochemicals. In October, the Government of Iran implemented a ban on the export of about 50 products, which included molybdenum and other mineral products, to ensure a domestic supply of the products. The ban appeared to have increased the local supply of banned products but had a limited effect on the global supply of those products (Watanabe, 2012; Turquoise Partners, 2013, p. 3).

Three types of economic sanctions imposed against Syria by the United States in previous years continued throughout 2013. The most comprehensive sanction was called the Syria Accountability Act of 2004, which prohibits the export of most goods containing more than 10% U.S.-manufactured component parts to Syria. Another type of sanction, resulting from the USA Patriot Act, was levied specifically against the Commercial Bank of Syria in 2006. The third type of sanction is contained in Executive Orders 13224, 13315, 13338, 13382, 13399, 13441, 13460, 13572, 13573, and 13582 from the President of the United States; these Executive orders specifically deny certain Syrian citizens and entities access to the U.S. financial system because of their participation in the proliferation of weapons of mass destruction, their association with Al Qaida or the Taliban, and (or) their association with destabilizing activities in Iraq and Lebanon (Obama, 2011; U.S. Department of State, 2012).

The EU Council extended its sanctions against Syria until June 2015; these sanctions included an oil embargo and other trade bans as well as restrictions on investments, financial activity, and transport sector activity. Additional actions by the EU Council included freezing assets of a number of entities and individuals associated with the violent repression in Syria, including the Central Bank of Syria (Council of the European Union, 2014).

As of yearend 2013, Iraq's draft gas and oil legislation, known as the Hydrocarbon Law, which was first proposed in 2007 and had been under examination in the Council of Ministers since October 2008, remained stalled because of disagreements among Iraqi parties on wider political issues, including revenue sharing. The proposed law would create an oil and gas council to oversee the country's oil and gas sector and would establish the Iraq National Oil Co. (U.S. Energy Information Administration, 2015).

Lebanon's first hydrocarbon law, Offshore Petroleum Resources Law (law 132 of August 24, 2010), was approved by the Cabinet on August 17, 2011. The law implemented a production-sharing and royalty scheme applied through an exploration and production agreement between the Government and prequalified companies. In 2012, the Government created the Lebanese Petroleum Administration under the Ministry of Energy and Water to manage petroleum-related activities in the waters of the Exclusive Economic Zone and in Lebanon's territorial waters (Lebanese Petroleum Administration, 2015).

In Oman, the Government stopped accepting new applications for mining licenses in 2013 while it was conducting a comprehensive review of the country's mining industry. The Government intended to enact and give priority to mining projects that include a value-added component to any mineral commodity produced in the country. The Ministry of Commerce and Mining, which is responsible for regulating quarrying and mining activities in Oman, closed several sites that were designated for construction aggregate, chromite, and marble mining and crushing because of their alleged violations of the terms of their mining licenses, such as illegal quarrying and (or) mining for industrial minerals that were not covered by the quarrying or mining license. An advisory committee, which included representatives from nine Government agencies, was formed to investigate mining issues in the country. The committee decided that mining and quarrying licenses were to be issued only to companies jointly owned by 35 or more Omani citizens. The committee also decided that mining companies should invest 5% of their profits in welfare projects in the local communities. The Government was expected to issue a new mining law in 2015 (Khan, 2012; Gulf News, 2013; Central Bank of Oman, 2014, p. 47).

Exploration

Local and international exploration companies explored for minerals in most of the countries of the region. In 2013, nonfuel mineral exploration in the region was carried out mainly in

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Iran, Oman, and Saudi Arabia. Metal exploration in the region focused on copper, gold, lead, uranium, and zinc (table 3).

State-owned and international oil companies explored for hydrocarbons in many of the countries in the region. Exploration activities continued in such countries as Iran, Iraq, Israel, Kuwait, and Saudi Arabia. Five crude oil discoveries were reported in Iraq, four in Kuwait, and one each in Oman and Yemen. One natural gas discovery was reported in Qatar (Organization of Arab Petroleum Exporting Countries, 2014, p. 20, 22; U.S. Energy Information Administration, 2014).

Commodity Overview

The main contributions of the Middle East region to the world's supply of mineral commodities were crude oil (33.9%), natural gas (16.9%), gypsum (9.4%), refinery petroleum products (9.1%), aluminum (9.0%), potash (8.7%), ammonia (8.1%), phosphate rock (5.5%), cement (4.8%), chromium (3.4%), and crude steel (1.8%) (table 4; BP p.l.c., 2014, p. 20).

Tables 5–14 include the Middle East's historical production data of major mineral commodities for 2005, 2010, 2012, and 2013, and estimates for metal production in the region for 2016, 2018, and 2020. Estimates for the production of major mineral commodities for 2016 and beyond have been based upon supply-side assumptions, such as announced plans for increased production and (or) new capacity construction and bankable feasibility studies. The outlook tables in this summary chapter show historic production and projected production trends; no indication is made about whether the historical data are estimated or reported, and revisions are not identified. Data on individual mineral commodities in the tables within the individual country chapters are labeled to indicate estimates and revisions. The outlook segments of the mineral commodity tables are based on projected trends that could affect current (2013) producing facilities and (or) on planned new facilities that operating companies, consortia, or Governments have projected to come online within indicated timeframes.

Forward-looking information, which includes estimates of future production, exploration and mine development, cost of capital projects, and timing of the start of operations, are subject to a variety of risks and uncertainties that could cause actual events or results to differ significantly from expected outcomes. Projects listed in the following section are presented as an indication of industry plans and are not a USGS prediction of what will take place.

Metals

Aluminum and Bauxite and Alumina.—Iran and Saudi Arabia were the only producers of bauxite in the Middle East in 2013. Iran produced 900,000 metric tons (t) of bauxite and Saudi Arabia produced more than 1 Mt of low-grade bauxite in 2013. Saudi Arabia was expected to begin production of high-grade bauxite for use in aluminum production starting in 2014 (table 5).

The region's bauxite output is expected to increase by about 163% in 2018 to 5.0 Mt from 1.9 Mt in 2013 mainly because of the expected increase in bauxite production by the Ma'aden Bauxite and Alumina Co. of Saudi Arabia at the Al Baitha Mine by 2014 (table 5; Saudi Arabian Mining Co., 2014, p. 81).

Iran was the only alumina producer in the Middle East region in 2013. Production at its Jajarm refinery, which was operated by Iran Aluminum Co., increased by 10% in 2013 compared with that of 2012 (table 6). In Saudi Arabia, the Ras Al Khair alumina refinery, which was under construction in 2013, was expected to begin production in 2014. The refinery would be the first in the GCC countries and would have the capacity to produce 1.8 Mt of alumina. The bauxite for the Ras Al Khair refinery would be transferred by rail from the Al Baitha Mine (Saudi Arabian Mining Co., 2014, p. 80).

In the UAE, Emirates Global Aluminium (EGA) was expected to build a $3 billion alumina refinery in Abu Dhabi that would have the capacity to produce 4 million metric tons per year (Mt/yr). EGA would use imported bauxite for alumina production. The Abu Dhabi refinery was expected to be built in two phases; each would expand production capacity by 2 Mt/yr. Production from the first phase was expected to begin in 2017 (Kassem, 2014).

In 2013, Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO) was building a new alumina plant, the Persian Gulf Alumina plant, that would have the capacity to produce 1.5 Mt/yr of alumina when it is completed by 2025. The company also planned to produce alumina from the nepheline syenite deposit at Sarab in northwestern Iran (table 6; Iranian Mines and Mining Industries Development and Renovation Organization, 2015, p. 53).

The Middle East region produced 4.3 Mt of aluminum in 2013, and its share of world production was about 9% in 2013 (table 4). The region's production of primary and secondary aluminum increased by 6% compared with that of 2012 (table 7).

In 2013, Ma'aden Aluminium Co. began production from Saudi Arabia's first aluminum smelter, which was located at Ras Al Khair, about 90 kilometers (km) northwest of Jubail. The smelter had the capacity to produce 740,000 metric tons per year (t/yr) of primary aluminum (table 7; Saudi Arabian Mining Co., 2014, p. 80–81).

In 2013, the UAE became a major world producer of aluminum as a result of the merger of Dubai Aluminium Co. Ltd. and Emirates Aluminium Co. Ltd. (EMAL) into one entity named Emirates Global Aluminium (EGA). EGA became the world's fifth-ranked aluminum company (valued at $15 billion), and was expected have 2.4 Mt/yr of primary aluminum production capacity and a combined power-generation capacity of 5,350 megawatts when the construction of EMAL's phase 2 expansion project is completed in 2014 (Emirates Global Aluminium, 2014).

Aluminum production in the region is projected to increase by 63% to about 6.94 Mt/yr by 2020 from about 4.30 Mt in 2013 following the completion of new smelters in the region, including those that were being built in Iran and Saudi Arabia, and the planned expansion of smelters in Bahrain, Oman, and the UAE. In addition to primary aluminum production, a number of downstream facilities in such countries as Bahrain, Iran, Oman, Qatar, and the UAE produced value-added aluminum products (table 7).

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Chromium.—In 2013, the Middle East region accounted for 3% of the world's production of chromite. Iran and Oman were the two countries in the region that produced chromium in 2013. Oman's production of chromite (in metal content) increased by 31% in 2013 compared with 2012, whereas Iran's production remained at the same level as that of 2012. Oman's increase in production was attributed to the lifting of export restrictions, which were imposed in 2012, and the beginning of operations of chromite concentrators and ferrochrome smelters (tables 4, 8).

In 2013, four ferrochrome smelters were at various stages of construction at Freezone Sohar. Muscat Overseas Group, which was the parent company of Al Tamman Trading Establishment L.L.C., and Indsil Group of India were building two ferrochrome smelters in Oman that would each have the capacity to produce 75,000 t/yr of ferrochrome. The first ferrochrome smelter was completed in 2013, and the second was expected to be completed by the end of 2014. Metkore Alloys & Industries Ltd. of India had started preparation work to build a 165,000-t/yr-capacity ferrochrome smelter, which also would be located at Freezone Sohar. The smelter, which was expected to commence production in 2014, would use chromite mined in Oman; the smelter's entire output would be exported to India. Gulf Mining Group was also building a ferrochrome smelter in Oman that would have the capacity to produce 50,000 t/yr of ferrochrome (Al Tamman Trading Establishment L.L.C., 2012; Watts, 2012).

Copper.—The Middle East region was a minor contributor to the world's copper supply. Copper mine production decreased in Oman and increased in Saudi Arabia in 2013 compared with that of 2012. Iran was the leading copper producer in the region. In Saudi Arabia, Al Masane Al Kobra Mining Co. began production of copper and zinc concentrates from the Al Masane Mine (table 9).

Copper mine production in the Middle East region is expected to increase by 98% in 2016 and by 133% in 2020 compared with 2013 production; most of the increase would be in new projects in Iran, which was expected to expand its primary copper smelting and refining capacity during the next 5 years (table 9). New copper production projects included those of the National Iranian Copper Industries Co. (NICICO), which were expected to increase the company's copper ore output to 700,000 t/yr of cathode copper by 2015. NICICO was developing additional copper mine capacity at the Chah-Firoozeh, the Chah-Mesi, the Daraloo, the Darreh Zar, the Ijoo, and the Nochoon Mines in Kerman Province; the Chehel-Kooreh Mine in the Sistan-Baluchestan Province; the Masjed Daghi and Haft-Cheshmeh Mines in East Azerbaijan Province; the Kahang Mine in Isfahan Province; and the Taft copper mine in Yazd Province. NICICO planned to build copper refineries at the Shahre Babak copper complex, which included the Miduk leaching plant and the Khatoonabad smelter, and at the Sungun copper complex in East Azerbaijan Province (tables 9, 10; National Iranian Copper Industries Co., 2015, p. 19, 21, 23).

In Israel, Altos Hornos de México S.A.B. de C.V. (AHMSA) planned to reopen the Timna copper mines near Eliat. In 2013, the company was engaged in the construction of a new solvent extraction and electrowinning plant with a capacity of 30,000 t/yr of copper (Altos Hornos de México S.A.B. de C.V., 2014, p. 3).

In Saudi Arabia, the Jabal Sayid project, which was a 50–50 joint venture of Ma'aden and Barrick Gold Corp. of Canada, was developing the Jabal Sayid copper mine, which is located 350 km northeast of Jeddah. The joint venture was expected to begin production at the mine in 2016 at a capacity of 45,000 t/yr of copper in concentrate (Barrick Gold Corp., 2014).

Gold.—The Middle East was a modest contributor to the world's supply of gold. Saudi Arabia and Iran were the major gold producers in the region in 2013. The region's gold production decreased by 14% in 2013 compared with that of 2012 (table 11).

The region's gold output was expected to double in 2016 and again in 2018 with the completion of planned increases in the production capacity of gold mines in Iran and Saudi Arabia. Gold output is expected to increase to about 22 t of mined gold by 2020 (table 11).

Iron and Steel.—Continued demand for steel reinforcing bar (rebar) for concrete by the construction industry for commercial projects, educational institutions, industrial buildings, and residential housing spurred most of the planned expansions of steel production capacity in the Middle East. The Middle East region produced 38% of the world's DRI in 2013. With the exception of Iran, the iron ore used at DRI plants was imported entirely from outside the region (Midrex Technologies Inc., 2014, p. 7).

The Middle East was a minor contributor to the world's steel production (1.6% of total world production). The region's total crude steel production increased by 8% in 2013 compared with that of 2012. Iran was the region's leading steel producer (15.4 Mt), followed by Saudi Arabia (5.5 Mt), and the UAE (2.9 Mt). In terms of tonnage, Iran also was the region's leading producer of DRI (14.5 Mt), followed by Saudi Arabia (6.1 Mt), and the UAE (3.1 Mt) (table 4, 13; Midrex Technologies Inc., 2014, p. 7).

Crude steel production is expected to more than double in the region between 2013 and 2020. Most of the increase would be in Iran where the Government had set a production target of 45 Mt of crude steel by 2020. Saudi Arabia also planned to double its crude steel output during the next 5 years (table 13).

Iron Ore.—Iran was the sole producer of iron ore in the region. The country's production has been increasing in recent years. The 12% increase in iron ore production in 2013 compared with that of 2012 was attributed to a new iron ore mine that opened at Chah Gaz in 2013. Iran planned capacity expansion projects at the iron ore mines of Chadormalu Mining and Industrial Co., Gol-e-Gohar Iron Ore Co., and Sangan Iron Ore Co. The projects were expected to be completed by 2016 (table 12; Tehran Times, 2012).

Industrial Minerals

Diamond.—No rough diamond was produced from mines in the Middle East region. Diamond cutting and trading, however, was a notable segment of the mineral economies of Israel, Lebanon, and the UAE, all of which were Kimberley Process Certification Scheme participants.

Israel was one of the world's leading diamond cutting and trading centers. Domestic diamond cutting and polishing

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companies specialized in large, high-value gemstones. In 2013, the value of Israel's cut and polished diamond exports increased to $6.2 billion from $5.6 billion in 2012.

Lebanon's diamond exports decreased by about 62% in value and 56% in quantity in 2013 compared with those of 2012. Exports of rough and polished diamond were 310,997 carats valued at $48 million in 2013 compared with 704,390 carats valued at more than $125 million in 2012. Similarly, diamond imports decreased by 55% in quantity and 60% in value compared with those of 2012. Lebanon imported 304,533 carats valued at about $45 million in 2013 compared with 683,390 carats of diamond valued at about $113 million in 2012 (Kimberley Process Certification Scheme, 2013, 2014).

The UAE was a global diamond trading hub. The country's imports of rough diamond increased by 13% in 2013 to 67.3 million carats compared with 59.7 million carats in 2012. The UAE's exports of rough diamond increased by 12% in quantity in 2013 to 67.9 million carats compared with 60.4 million carats in 2012 (Kimberley Process Certification Scheme, 2013, 2014; Dubai Multi Commodities Centre Authority, 2014).

Nitrogen.—In 2013, the region produced 10 Mt of ammonia (N content), which was 7% of the world's production. The entire output of ammonia in the region was manufactured from natural gas feedstock using the Haber-Bosch process. Saudi Arabia was the leading producer of ammonia in the region (3.2 Mt), followed by Qatar (3.0 Mt), and Iran (2.5 Mt) (table 4).

Phosphate Rock.—Jordan remained the region's leading producer of phosphate rock in 2013, followed by Israel, Saudi Arabia, and Syria (table 4). Saudi Arabia, which produced 2.8 Mt of phosphate rock for the first time in 2013, was expected to become the region's leading producer with the capacity to produce 11.6 Mt/yr of phosphate rock following the completion of the Al Jalamid phosphate mine, the Ras Al Khair fertilizer plant, and the Wa'ad Al Shamal project. Ma'aden's 3-Mt/yr-capacity diammonium phosphate fertilizer complex at Ras Al Khair began commercial production in 2012. Saudi Arabia was planning to develop another phosphate mining and fertilizer manufacturing complex at Wa'ad Al Shammal in 2016 (Saudi Arabian Mining Co., 2014, p. 75–77).

Rotem Amfert Negev Ltd. (a subsidiary of Israel Chemicals Ltd.) produced phosphate rock at the Arad, the Oron, and the Zin Mines in the Negev Desert. The production of beneficiated phosphate rock increased slightly to 3.58 Mt in 2013 from 3.51 Mt in 2012 (Israel Chemicals Ltd., 2014, p 11).

Mineral Fuels

Coal.—Iran was the only country the Middle East that produced coal. Iran's salable coal production increased by 11% to 3.1 Mt in 2013 from 2.8 Mt in 2012. IMIDRO planned to increase its production of coking coal by 30% to 1.2 Mt in 2014 from 922,000 t in 2013. IMIDRO hoped to produce 3.4 Mt of coking coal by 2016 (table 14; Iranian Mines and Mining Industries Development and Renovation Organization, 2015, p. 22, 49).

Natural Gas and Petroleum.—In 2013, the Middle East region's share of the world's crude oil and natural gas production in 2013 was 33.9% and 16.9%, respectively. Saudi Arabia was the world's leading crude-oil-producing country, in terms of the volume of production, with output of 4.2 billion barrels (Gbbl) in 2013. Other notable crude-oil-producing countries in the region (based on production volume) included Iran (ranked sixth in the world), the UAE (seventh), Kuwait (eighth), and Iraq (ninth). Saudi Arabia held 15.8% of the world's proven crude oil reserves; Iran, 9.3%; Iraq, 8.9%; Kuwait, 6.0%, and the UAE, 5.8% (table 4; BP p.l.c., 2014, p. 6, 8, 20, 22).

The Middle East region was responsible for 9.1% of the world's total output of refinery products in 2013. The region's total output of refined petroleum products was about 2.5 billion barrels. With the exception of Lebanon, all countries in the region carried out petroleum refining activities (table 4).

Three crude oil refineries were under construction in Saudi Arabia in 2013. They were the 400,000-barrel-per-day (bbl/d)-capacity heavy-crude-oil refinery for Saudi Aramco Total Refining and Petrochemical Co. at Jubail, which began initial operations in 2013; the 400,000-bbl/d-capacity heavy-crude-oil refinery of Yanbu Aramco Sinopec Refining Company Ltd., which was expected to be completed by 2014 by the joint venture of Saudi Aramco and China Petrochemical Corp. (Sinopec); and the proposed 400,000-bbl/d-capacity heavy-crude-oil Jazan refinery and terminal project, which was scheduled to be operational by 2016 (Saudi Arabian Oil Co., 2014, p. 33–37).

The UAE had five refining facilities in 2013. The largest was at Ruwais and was operated by Abu Dhabi Oil refining Co. (Takreer), which was a wholly owned subsidiary of ADNOC, and had the capacity to refine 350,000 bbl/d of crude oil. The Ruwais refinery was expected to begin a $10 billion expansion project that would add 417,000 bbl/d of crude oil production capacity, bringing the overall capacity to 800,000 bbl/d by mid-2014 (Abu Dhabi National Oil Co., 2014, p. 8, 12; Oil and Gas Journal, 2014).

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TABLE 1
MIDDLE EAST: AREA AND POPULATION IN 2013

Country/Territory	Area[1] (square kilometers)	Estimated population[2] (millions)
Bahrain	760	1.3
Iran	1,648,195	77.2
Iraq	438,317	33.8
Israel	220,770	8.1
Jordan	89,342	6.5
Kuwait	17,818	3.6
Lebanon	10,400	4.5
Oman	309,500	3.9
Qatar	11,586	2.1
Saudi Arabia	2,149,690	30.2
Syria	185,180	21.8
United Arab Emirates	83,600	9.0
West Bank and Gaza Strip	6,220	4.2
Yemen	527,968	25.5
Total	5,699,350	231.7
World	510,072,000	7,125.0

[1]Source: U.S. Central Intelligence Agency, The World Factbook.
[2]Source: The World Bank, 2014 World Development Indicators Database.

TABLE 2
MIDDLE EAST: GROSS DOMESTIC PRODUCT[1,2]

Country/Territory	Gross domestic product in 2013 based on purchasing power parity: Gross value (million dollars)	Gross domestic product in 2013 based on purchasing power parity: Per capita (dollars)	Real gross domestic product growth rate (percentage): 2011	2012	2013
Bahrain	58,281	49,633	2.1	3.4	5.3
Iran	1,244,330	16,165	4.0	-6.6	-1.9
Iraq	499,618	14,367	10.2	10.3	4.2
Israel	257,511	32,717	4.2	3.0	3.2
Jordan	76,167	11,639	2.6	2.7	2.9
Kuwait	275,360	70,785	10.2	8.3	-0.4
Lebanon	77,403	17,326	2.0	2.5	1.5
Oman	155,640	43,304	4.1	5.8	4.8
Qatar	298,388	145,894	13.0	6.1	6.5
Saudi Arabia	1,553,060	51,779	8.6	5.8	4.0
Syria	43,375[3]	1,981[3]	-3.7[4]	-28.9[4]	-6.8[4]
United Arab Emirates	570,574	63,181	4.9	4.7	5.2
West Bank and Gaza Strip[5]	12,476	2,970	12.4	6.3	2.2
Yemen	102,333	3,838	-12.7	2.4	4.8
Total	5,224,516	22,729[6]	1.4[7]	-1.1[7]	0.9[7]
World total	101,623,212	14,307[6]	4.1	3.4	3.3

[1]Source: International Monetary Fund, World Economic Outlook Database, October 2014.
[2]Gross domestic product listed may differ from that reported in individual country chapters owing to differences in the source or date of reporting.
[3]Estimated based on United Nations data for 2012.
[4]United Nations Refugees Work Agency estimates.
[5]Source: Palestinian Central Bureau of Statistics.
[6]Calculated using country data reported by the International Monetary Fund and the World Bank.
[7]Weighted average.

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TABLE 3
MIDDLE EAST: SELECTED EXPLORATION ACTIVITY IN 2013[1]

Country	Type[2]	Prospect	Commodity	Companies	Resource notes[2,3]	Exploration notes
Iran	P	Ardakan (Saghand)	U_3O_8	Government of Iran	2,400 t U_3O_8 (R)	Commenced production.
Do.	F	Haft Cheshmeh	Cu	National Iranian Copper Corp.	478,000 t Cu (R)	Evaluating development.
Do.	P	Zarshoran	Au	Government of Iran	2.9 Moz Au (R)	Commenced production.
Jordan	P	Eshidiya	P_2O_5	Jordan Phosphate Mines Co.	Data not released	Plan drilling program.
Do.	P	Wadi al Abiad	P_2O_5	do.	do.	do.
Oman	E	Daris	Cu, Au	Alara Resources Ltd.	68,000 t Cu, 37,000 oz Au (D)	Ongoing scoping study.
Saudi Arabia	D	Ad Duwayhi	Au	Saudi Arabian Mining Co.	1.76 Moz Au (R)	Planned construction contract.
Do.	E	Jibal Qutman	Au	Abdul Rahman Saad Al-Rashid	482,000 oz Au (IF)	Ongoing exploration.
Do.	F	Khnaiguiyah	Zn, Au, Cu	Alara Resources Ltd.	1 Mt Zn, 5.5 Moz Au, 43,000 t Cu (D)	do.
Do.	D	Northern Promise	P_2O_5	Saudi Arabian Mining Co.	Data not released	Development ongoing.
Yemen	E	Al Hariqah	Au	Cantex Mine Development Corp.	1.9 Moz Au (ID)	Ongoing drilling.

Do. Ditto.
[1]Abbreviations used for commodities include the following: Au—gold; Cu—copper; P_2O_5—phosphate; U_3O_8—uranium oxide; Zn—zinc. Abbreviations used for units of measure include the following: Moz—million troy ounces; Mt—million metric tons; oz—troy ounces; t—metric tons.
[2]D—Approved for development; E—Active exploration; F—Feasibility work ongoing/completed; P—Exploration associated with producing site.
[3]Based on 2013 data reported from various sources; D—measured + indicated; ID—indicated; IF—inferred; R—proven + probable. Resource data have not been verified by the U.S. Geological Survey.

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TABLE 4
MIDDLE EAST: PRODUCTION OF SELECTED MINERAL COMMODITIES IN 2013[1]

(Thousand metric tons unless otherwise specified)

	Metals			Industrial minerals					Mineral fuels and related products	
									Petroleum	
Country	Aluminum, metal, primary	Chromite, mine output, gross weight	Steel, crude[e]	Ammonia, N content	Cement, hydraulic[e]	Gypsum[e]	Phosphate rock, gross weight[e]	Potash, K_2O equivalent	Crude, including condensate (thousand 42-gallon barrels)	Refinery products (thousand 42-gallon barrels)
Bahrain	913	--	--	378	1,200 [2]	--	--	--	72,123	99,963
Iran	350	400	15,400	2,500 [e]	70,000	15,000	100	--	1,300,000 [e]	640,000 [e]
Iraq	--	--	--	146	10,000	1,400	350	--	1,146,465	219,365
Israel	--	--	500	--	6,398 [2]	27 [2]	3,578 [2]	2,155	383	105,000 [e]
Jordan	--	--	150	--	5,000	857	5,399 [2]	1,046	8,000	24,522
Kuwait	--	--	1,500	500 [e]	2,250	--	--	--	1,140,000 [e]	336,000 [e]
Lebanon	--	--	--	--	5,831 [2]	110	--	--	--	--
Oman	354	788	160	1,100 [e]	4,472 [2]	2,785 [2]	--	--	343,830	69,660
Qatar	634	--	2,236 [2]	2,985	5,335 [2]	145	--	--	728,175	171,889
Saudi Arabia	187	--	5,471 [2]	3,209	57,000	2,500	2,810	--	3,517,000	600,973
Syria	--	--	10	50 [e]	4,000	300	1,000	--	20,440	NA
United Arab Emirates	1,864	--	2,878 [2]	658	21,000	700	--	--	1,330,790	173,193
Yemen	--	--	--	--	3,000 [2]	100	--	--	58,765	30,000 [e]
Total	4,300	1,190	28,300	11,500	195,000	23,900	13,200	3,200	9,670,000	2,470,000
Share of world total	9.0%	3.4%	1.8%	8.1%	4.8%	9.4%	5.5%	8.7%	33.9%	9.1%
United States	1,950	--	86,900	9,170 [3]	77,400	15,500	31,200	2,220	2,720,000	4,430,000
Total, world	47,600	34,500	1,610,000	142,000	4,090,000	255,000	243,000	36,800	28,600,000	27,100,000

[e]Estimated; estimated data, U.S. data, and world totals are rounded to no more than three significant digits. NA Not available. -- Zero.
[1]Totals may not add due to independent rounding. Percentages are calculated on unrounded data. Includes data available as of October 16, 2015.
[2]Reported figure.
[3]Synthetic anhydrous ammonia; excludes coke oven byproduct ammonia.

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TABLE 5
MIDDLE EAST: HISTORIC AND PROJECTED BAUXITE MINE PRODUCTION, 2005–2020[1]

(Metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Iran	437,595	714,800	898,400	900,000	1,000,000	1,000,000	1,000,000
Saudi Arabia[2]	--	284,000	760,000	1,044,000	4,000,000	4,000,000	4,000,000
Total	438,000	999,000	1,660,000	1,940,000	5,000,000	5,000,000	5,000,000

[e]Estimated. -- Negligible or no production.
[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.
[2]Does not include production of low-grade bauxite for cement, which began in 2008.

TABLE 6
MIDDLE EAST: HISTORIC AND PROJECTED ALUMINA PRODUCTION, 2005–2020[1]

(Metric tons)

Country	2005	2010	2012	2,013	2016[e]	2018[e]	2020[e]
Iran	130,000	236,000	227,000	249,000	790,000	1,000,000	1,500,000
Saudi Arabia	--	--	--	--	1,800,000	1,800,000	1,800,000
United Arab Emirates	--	--	--	--	--	2,000,000	4,000,000
Total	130,000	236,000	227,000	249,000	2,590,000	4,800,000	7,300,000

[e]Estimated. -- Negligible or no production.
[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 7
MIDDLE EAST: HISTORIC AND PROJECTED PRIMARY AND SECONDARY ALUMINUM METAL PRODUCTION, 2005–2020[1]

(Metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Bahrain[2]	750,700	850,700	890,000	913,000	913,000	928,000	1,450,000
Iran	220,000	303,000	337,000	350,000	487,000	1,100,000	1,100,000
Oman	--	367,000	360,000	354,000	375,000	375,000	400,000
Qatar	--	126,000	628,000	634,000	630,000	630,000	630,000
Saudi Arabia	--	--	--	187,000	760,000	760,000	760,000
United Arab Emirates	722,000	1,400,000	1,820,000	1,864,000	2,400,000	2,400,000	2,600,000
Total	1,690,000	3,050,000	4,040,000	4,300,000	5,570,000	6,200,000	6,900,000

[e]Estimated. -- Negligible or no production.
[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.
[2]May include some secondary aluminum produced from used beverage cans.

TABLE 8
MIDDLE EAST: HISTORIC AND PROJECTED CHROMIUM MINE PRODUCTION, 2005–2020[1]

(Metric tons of metal content)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Iran	110,000	100,000	190,000	190,000	200,000	200,000	200,000
Oman	12,000	350,000	211,000	276,000	350,000	350,000	350,000
Total	122,000	450,000	401,000	466,000	550,000	550,000	550,000

[e]Estimated.
[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

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TABLE 9
MIDDLE EAST: HISTORIC AND PROJECTED COPPER MINE PRODUCTION, 2005–2020[1]

(Metal content of concentrate in metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Iran	190,000	210,000	260,000	220,000	430,000	500,000	500,000
Israel	--	--	--	--	8,000	20,000	20,000
Oman	2,000	2,000	2,000	1,000	4,000	4,000	4,000
Saudi Arabia	668	1,600	6,000	10,000	15,000	15,000	15,000
Total	193,000	214,000	268,000	231,000	460,000	540,000	540,000

[e]Estimated. -- Negligible or no production.
[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 10
MIDDLE EAST: HISTORIC AND PROJECTED REFINED COPPER METAL PRODUCTION, 2005–2020[1,2]

(Metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Iran	178,000	220,000	225,000	260,000	360,000	500,000	700,000
Israel	--	--	--	--	13,000	20,000	20,000
Oman	24,543	15,000	16,000	16,000	32,000	32,000	32,000
Total	203,000	235,000	241,000	276,000	405,000	550,000	750,000

[e]Estimated. -- Negligible or no production.
[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.
[2]May include secondary production.

TABLE 11
MIDDLE EAST: HISTORIC AND PROJECTED GOLD MINE PRODUCTION, 2005–2020[1]

(Metal content in kilograms)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Iran	1,000	1,000	2,000	1,700	3,000	6,000	6,000
Oman	384	82	--	--	100	100	100
Saudi Arabia	7,456	4,476	4,347	3,789	7,000	15,600	15,600
Total	8,840	5,560	6,350	5,490	10,100	21,700	21,700

[e]Estimated. -- Negligible or no production.
[1]Estimated data and totals are rounded to no more than three significant digits; may not add to totals shown.

TABLE 12
MIDDLE EAST: HISTORIC AND PROJECTED IRON ORE PRODUCTION, 2005–2020

(Metal content in thousand metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Iran	7,400	16,100	21,700	24,300	25,000	25,000	25,000

[e]Estimated; estimated data are rounded to no more than three significant digits.

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TABLE 13
MIDDLE EAST: HISTORIC AND PROJECTED CRUDE STEEL PRODUCTION, 2005–2020[1]

(Thousand metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Iran	9,400	12,000	14,500	15,400	37,000	45,000	45,000
Iraq	--	--	--	--	2,000	2,000	2,000
Israel	480	430	500	500	500	500	500
Jordan	150	160	160	160	390	390	390
Kuwait	450	500	1,300	1,500	1,300	1,300	1,300
Oman	84	84	160	160	4,000	6,000	6,000
Qatar	1,057	1,705	2,100	2,236	3,000	3,000	4,000
Saudi Arabia	4,185	5,000	5,200	5,471	10,200	10,200	10,200
Syria	70	70	10	10	100	100	100
United Arab Emirates	90	1,180	2,408	2,878	5,500	5,500	5,500
Total	16,000	21,400	26,300	28,300	64,000	74,000	75,000

[e]Estimated. -- Negligible or no production.
[1]Estimated data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 14
MIDDLE EAST: HISTORIC AND PROJECTED SALABLE COAL PRODUCTION, 2005–2020[1]

(Thousand metric tons)

Country	2005	2010	2012	2013	2016[e]	2018[e]	2020[e]
Iran	1,899	2,324	2,820	3,140	11,700	11,700	11,700

[e]Estimated; estimated data are rounded to no more than three significant digits.
[1]Includes anthracite, bituminous, and lignite.

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The Mineral Industry of Bahrain

By Mowafa Taib

The Kingdom of Bahrain is the smallest country in the Middle East region in terms of land area (770 square kilometers) and population (1.2 million). Bahrain is one of the six countries that make up the Cooperation Council for Arab States of the Gulf, better known as the Gulf Cooperation Council (GCC). In 2013, Bahrain's primary aluminum output accounted for 1.9% of total world production, making the country the world's 10th-ranked producer of primary aluminum. Other mineral commodities produced in Bahrain included ammonia, cement, crude oil, direct-reduced iron (DRI), iron ore pellets from imported iron ore, ferromanganese, ferrosilicon, methanol, natural gas, refined petroleum products, stainless steel, sulfur, and urea (table 1; Bray, 2014; Central Information Organization, 2014a).

Minerals in the National Economy

In 2013, Bahrain's gross domestic product (GDP) increased by 4.9% in real terms compared with an increase of 3.4% in 2012. The hydrocarbon sector, which accounted for 21% of the GDP, increased in value by 15.3% in real terms in 2013 compared with a decrease of 8.5% in 2012. The manufacturing sector, which included aluminum, fertilizer, and iron and steel production, accounted for 12% of the GDP. The Government's gas and oil revenue accounted for 88% of the country's total revenue in 2013 compared with about 87% in 2012 (Central Bank of Bahrain, 2014, p. 5, 7; International Monetary Fund, 2014, p. 4).

Production

United Steel Co. B.S.C. (SULB), which was a joint venture of Gulf United Steel Holding Co. (Foulath, 51% interest) and Yamato Kogyo Co. Ltd. of Japan (49% interest) commenced production at its 1.5-million-metric-ton-per-year (Mt/yr)-capacity DRI plant at the Hidd Industrial Area in Bahrain for the first time, and partial year output in 2013 was 780,000 metric tons (t). Primary aluminum output, which was produced solely by Aluminium Bahrain B.S.C. (Alba), increased by 2.5%. Bahrain's crude oil production increased by about 14% and gross natural gas production increased by 2.6% compared with those of 2012. The increase was attributed to the completion of the Bahrain National Gas Co. B.S.C. (Banagas) expansion projects. Ammonia and urea production, which were solely produced by Gulf Petrochemical Industries Co. B.S.C. (GPIC), increased by 12% and 10%, respectively, compared with those of 2012 (table 1).

Structure of the Mineral Industry

Bahrain had significant mineral industries for the Gulf region but, with the exception of quarrying for limestone for cement, there were no active mines in the country. The mineral industry included a petrochemical sector, which produced nitrogen fertilizer and depended on locally produced and imported crude oil, and aluminum and iron and steel sectors, which depended entirely on imported alumina and iron ore, respectively, for their operations. Although the Government was a major investor in Bahrain's mineral industries, companies from Kuwait, Saudi Arabia, and the United Arab Emirates (UAE) held substantial equity interest in most of the country's mineral enterprises. The National Oil and Gas Authority (NOGA) was the Government agency that was responsible for making policy, issuing regulations, and controlling the use of Bahrain's hydrocarbon resources. NOGA Holding Co. was NOGA's business and investment wing and the Government's shareholder in such companies as Bahrain Petroleum Co. B.S.C. (Bapco) (100% interest), Banagas (75% interest), Bahrain Aviation Fueling Co. (60% interest), Bahrain Lube Base Oil Co. (Bloc) (55% interest), Tatweer Petroleum (51% interest), Skaugen Gulf Petchem Carriers (35% interest), and GPIC (33.3% interest). Tatweer Petroleum was a joint venture of NOGA, Mubadala Development Co. of the UAE, and Occidental Petroleum Corp. of the United States and was created to increase crude oil production from the Bahrain oilfield and to meet Bahrain's future energy requirements (National Oil and Gas Authority, 2013, p. 8).

Alba was a public company listed on the Bahrain Bourse and the London Stock Exchange; its shares were distributed among Government-owned Bahrain Mumtalakat Holding Co. (69.38%), SABIC Industrial Investments Co. Ltd. of Saudi Arabia (20.62%), and others (10%) (Aluminium Bahrain B.S.C., 2014a, p. 46; Tatweer Petroleum, 2014).

Mineral Trade

In 2013, the value of Bahraini exports increased by 5.3% to $20.9 billion from $19.8 billion in 2012. The value of oil and refined products exports was $15.3 billion or 73.2% of total exports. The value of imports increased slightly to $13.7 billion in 2013 from $13.2 billion in 2012. The main mineral exports for Bahrain included primary and secondary aluminum products, ferroalloys, pelletized iron ore, and scrap metals, and the major minerals imports included alumina, gravel and crushed stone, iron ore, petroleum coke, and oilfield minerals, such as barite and bentonite (Central Information Organization, 2014a, b).

The value of U.S. exports to Bahrain decreased to $1,018 million from $1,176 million in 2012, and the value of U.S. imports from Bahrain decreased to $636 million from $701 million in 2012. U.S. exports to Bahrain included mainly civilian aircraft, industrial engines, machines, and passenger cars. Bahrain's exports to the United States included aluminum ($148 million), nitrogen fertilizer ($91 million), and finished metals ($33 million) (U.S. Census Bureau, 2014).

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Metals

Aluminum.—In 2013, Alba increased its primary aluminum output to about 913,000 t, which was a record high for the company, from 890,000 t in 2012. Alba's mix of aluminum products included extrusion billet (40%), liquid metal (31%), rolling slabs (13%), foundry alloys (13%), and standard ingots (3%). About 50% of the company's output was used locally; 25% was exported to other countries in the Middle East and North Africa; 11% went to Asian markets; 11%, to European markets; and 4%, to American markets. Alcoa World Alumina L.L.C. (AWA) of the United States supplied Alba with alumina under a long-term agreement. Alba's aluminum smelter consumed 775,000 t of petroleum coke to produce 550,000 t of carbon anode. The smelter, which employed 2,937 people in 2013, had a 2,219-megawatt installed powerplant capacity and the capacity to produce 41,000 cubic meters per day of desalinated water (table 1; Aluminium Bahrain B.S.C., 2014a, b).

AWA, which was owned by Alcoa Inc. (60%) and Alcoa Ltd. (40%), both of the United States, agreed to pay a total of $223 million, including a fine of $209 million, payable in five equal installments over 4 years, to Alba. The settlement followed the resolution of an investigation by the U.S. Department of Justice and the U.S. Securities and Exchange Commission concerning the lawsuit that was filed by Alba in 2008 in the Pittsburgh Federal District Court. The lawsuit alleged that Alcoa paid millions of dollars, through an agent, in bribes between 1990 and 2005 to Alba officials to win inflated contracts that resulted in Alcoa gaining more than $400 million in illegal profits. Alba was seeking more than $1 billion in damages (Alcoa Inc., 2014; Pearson, 2014).

Bahrain's downstream aluminum industries included Bahrain Aluminium Extrusion Co., which had the capacity to produce 25,000 metric tons per year (t/yr) of flat aluminum products; Aluminium Wheel Co. W.L.L., which had the capacity to produce 400,000 wheel castings per year; Bahrain Alloys Manufacturing Co., which had the capacity to produce 30,000 t/yr of aluminum alloys; Bahrain Atomisers International B.S.C., which produced aluminum powder; Bahrain Recycling Plant, which had the capacity to produce 120,000 t/yr of recycled aluminum products; Gulf Aluminium Rolling Mill Co. B.C.S., which produced 155,000 t/yr of rolled aluminum products; and Midal Cables Ltd., which had the capacity to produce 120,000 t/yr of aluminum cables (table 2).

Ferroalloys.—Bahrain Ferro Alloys B.S.C., which was a subsidiary of ETA Star Holdings L.L.C. of the UAE, produced ferrochrome, ferromanganese, and ferrosilicon to meet the demand of local and regional steel producers. The company had the capacity to produce 35,000 t/yr of ferromanganese and 250,000 t/yr of ferrosilicon, as well as an unknown capacity of ferrochrome, from its smelter at the Hidd Industrial Area. Bahrain Ferro Alloys was installing a submerged arc furnace capable of producing different ferroalloys. The smelter's production capacity was expected to double when the additional ferroalloys furnace is completed (Bahrain Ferro Alloys B.S.C., 2014).

Iron and Steel.—Foulath owned a majority interest in Gulf Industrial Investment Co. E.C. (GIIC), United Stainless Steel Co. B.S.C. (USCO), and SULB. GIIC, which was established as an integrated iron and steel producer, operated two Allis-Chalmers (grate-kiln) pelletizing plants at the Hidd Industrial Area with a combined production capacity of 11 Mt/yr of iron ore pellets for use in DRI plants. USCO had the capacity to produce 100,000 t/yr of stainless steel from imported black hot-band coils at its plant in the Hidd Industrial Area (table 2; Gulf Industrial Investment Co. E.C., 2013; Universal Rolling W.L.L., 2014).

In 2013, SULB completed building a $1 billion steel mill at the Hidd Industrial Area. The SULB iron and steel complex's three-module mill included a 1.5-Mt/yr-capacity DRI plant, a melt shop with a combined capacity of 850,000 t/yr of crude steel, and a 600,000-t/yr-capacity heavy-section rolling mill. Production from the complex began in the second quarter of 2013. Universal Rolling W.L.L., which was owned by Bahraini and Saudi investors and the Bahrain-based International Investment Bank, produced steel-reinforcing bar (rebar) from its mill in the Hidd Industrial Area. The production capacity of the mill was 200,000 t/yr of rebar (Universal Rolling W.L.L., 2014; Sulb Co. B.S.C., 2015).

Industrial Minerals

Cement.—Bahrain had one cement plant and one cement grinding mill in 2013. Falcon Cement Co., which was owned by Cemena Holding Company B.S.C. of Bahrain, produced cement at its plant in the Hufaira Industrial Area and had the capacity to produce 1.2 Mt/yr of cement (Falcon Cement Co. B.S.C., 2014). Arabian Gulf Cement Co. W.L.L. Bahrain, which was a subsidiary of Star Cement Co. W.L.L. of the UAE, operated a clinker-grinding mill and had the capacity to produce 400,000 t/yr of cement. Clinker was transferred from the company's other cement plants in the UAE. Star Cement was owned by UltraTech Cement Middle East Investments Ltd. of India (UltraTech Cement Middle East Investments Ltd., 2014).

Nitrogen (Ammonia), Methanol, and Urea.—In 2013, GPIC increased its ammonia production by 12%; urea production, by 10%; and methanol output, by 7% compared with those of 2012. GPIC continued construction work for its expansion plan to increase its production capacity to 766,500 t/yr of ammonia and 1.3 Mt/yr of urea. Most of the company's production of methanol and urea was exported, and most of the 461,000 t of ammonia output was used for urea production, whereas the remaining was exported. Ammonia exports, which amounted to about 73,000 t, were sent to Taiwan (27%), China and Australia (19% each), India (18%), and the Republic of Korea (16%). GPIC's methanol exports, which amounted to 447,000 t, went to China (57%), the United States (21%), Singapore (16%), Italy (3%), Thailand (2%), and Latin American countries (1%). GPIC's urea exports went to the United States (52%), Latin America (20%), Thailand (15%), and the remainder (13%) to African countries, Australia, Bangladesh, and the Philippines (Gulf Petrochemical Industries Co. B.S.C., 2014, p. 16, 25).

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Mineral Fuels

Natural Gas and Petroleum.—Bahrain's proven crude oil resources were estimated to be 125 million barrels (Mbbl) and proven natural gas resources 190 billion cubic meters as of yearend 2013. Bahrain produced about 17.5 Mbbl of petroleum from the Bahrain oilfield, which was operated by Bapco, and 54.6 Mbbl from Bahrain's 50% share of the Abu Saafa offshore oilfield; the Abu Saafa field was owned jointly by Bahrain and Saudi Arabia and operated by Saudi Arabia Oil Co. Banagas's total natural gas production, which included dry and associated gas, increased to 19.2 billion cubic meters in 2013 from 15.4 billion cubic meters in 2012. The increase was attributable to the completion of the company's series of expansions, which increased the production and processing capacity to 8.5 million cubic meters per day of natural gas from 3.5 million cubic meters per day (table 2; Bahrain Natural Gas Co. B.S.C., 2014).

NOGA's strategic projects included exploration for natural gas in the deep layers of the Bahrain oilfield; exploration and production in the marine areas of Block 1, which is located north of Bahrain; exploration and production in Blocks 3 and 4, which are located southeast of Bahrain Island; and conducting research on the most effective ways for consuming natural gas. The Government created Skaugen Gulf Petchem Carriers, which was a joint venture of I.M. Skaugen S.E. of Norway and NOGA Holdings (35% interest each) and Capital Management House (30% interest) to transport liquefied petroleum gas and liquefied natural gas (LNG). The Government was building an LNG import terminal to accommodate its imports of 14.2 million cubic meters per year of natural gas. In 2013, Bloc, which was a majority state-owned company, produced lubricating oil at its plant. The plant was considered the first of its kind in the region and had the capacity to produce 2.8 Mbbl/yr of high-viscosity index group III lubricant base oils.

Tatweer Petroleum moved forward with three crude oil and natural gas exploration and production projects. The projects would include exploration for natural gas in the deep layers of the Bahrain field; exploration and production in the marine areas of Block 1, which is located in northern Bahrain; and exploration and production in Blocks 3 and 4 in cooperation with Occidental Petroleum (National Oil and Gas Authority, 2013, p. 16).

Bapco planned to increase the production capacity at its oil refinery in Sitra to 330,000 barrels per day (bbl/d) from 265,000 bbl/d. The expansion project was expected to cost between $6 billion and $8 billion to build and be completed by 2019. Bapco moved forward with the engineering work for a pipeline that would transport crude oil from Saudi Arabia to the Sitra refinery in Bahrain. The pipeline would be more than 100 kilometers long and would cost $350 million to build. Construction was expected to be completed in 2015 (Bloomberg L.P., 2013; National Oil and Gas Authority, 2013, p. 17).

Outlook

Bahrain is likely to remain an important world supplier of aluminum, ammonia, and urea as well as regional supplier of DRI, ferroalloys, and pelletized iron ore. The Government, which received $10 billion in financial assistance in 2011 from the other GCC countries for 10 years, is planning to invest about $1 billion in infrastructure and housing projects in 2014.

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TABLE 1

BAHRAIN: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
METALS						
Aluminum metal, primary		848	851	881	890	913
Ferromanganese	metric tons	5,700	5,600	35,300	35,000	35,000
Ferrosilicon	do.	6,500	3,700	3,000	3,000	3,000
Iron and steel:						
Direct-reduced iron		--	--	--	--	780
Iron ore pellets[3]		3,286	8,000	11,000	11,000	11,000
Stainless steel[e]	metric tons	90,000	90,000	90,000	90,000	90,000
Steel-reinforcing bar[e]	do.	200,000	200,000	200,000	200,000	200,000
INDUSTRIAL MINERALS						
Cement		700	700	800	800	1,200
Nitrogen:						
N content of ammonia		390	357	380	341	378
N content of urea		332	290	310	288	316
Sulfur[e]		72	137	132	135	135
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	15,388	15,762	15,641	15,370 r	19,249
Dry	do.	12,700 r	12,800 r	13,100 r	13,700 r	15,800
Methanol		410	417	443	416	446
Natural gas plant liquids:						
Butane	thousand 42-gallon barrels	907	937	908	900	985
Naphtha	do.	1,730	1,835	1,760	1,800	1,898
Propane	do.	953	1,000	990	1,000	1,058
Petroleum:						
Crude[4]	do.	66,510	66,376	69,452	63,302	72,123
Refinery products:						
Liquefied petroleum gas	do.	365	548	584	600	600
Gasoline	do.	7,600	7,600	6,205	7,000	7,000
Kerosene and jet fuel	do.	1,716	1,606	1,168	1,600	1,600
Distillate fuel oil	do.	32,120	31,755	28,470	32,000	32,000
Residual fuel oil[e]	do.	15,330	15,330	16,279	18,000	18,000
Other[e]	do.	38,377	42,523	43,320	41,903	40,763
Total	do.	95,508	99,362	96,026	101,103	99,963

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. -- Zero.

[1]Table includes data available through June 30, 2014.

[2]Aggregate, ferrochrome, rock, and sand are also produced, but available information is inadequate to make reliable estimates of output.

[3]Pellets were produced from imported iron ore and exported for use by direct-reduction plants.

[4]Includes Bahrain's share of production from the Abu Saafa field.

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TABLE 2
BAHRAIN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum:				
Metal:				
Primary and secondary		Aluminium Bahrain B.S.C. (Bahrain Mumtalakat Holding Co., 69.38%; SABIC Industrial Investments Co. Ltd., 20.62%; others, 10%)	Smelter at Sitra	912,000
Secondary		Bahrain Recycling Plant (private, 100%)	Dross and scrap remelt facilities at Askar	4,500
Rolled products		Gulf Aluminium Rolling Mill Co. B.S.C. (Bahrain Mumtalakat Holding Co., 38%; Saudi Basic Industries Corp., 30%; Industrial Bank of Kuwait, 17%; Gulf Investment Corp., 6%; Government of Iraq, 5%; Government of Oman, 2%; Government of Qatar, 2%)	Rolling mill at Sitra	155,000
Do.		Midal Cables Ltd. (Intersteel W.L.L., 50%, and Saudi Cable Co., 50%)	Rolling mill at Manama	120,000
Alloys		Bahrain Alloys Manufacturing Co	Sitra	30,000
Flat products		Bahrain Aluminium Extrusion Co.	do.	25,000
Casting	wheel castings	Aluminium Wheel Co. W. L.L.	Manama	400,000
Powder		Bahrain Atomisers International B.S.C.	East Riffa Area	NA
Cement		Arabian Gulf Cement Co. W.L.L. (Star Cement Co. W.L.L., 100%)	Clinker grinding mill at Hidd	400,000
Do.		Falcon Cement Co. (Cemena Holding Company B.S.C., 100%)	Hufaira Industrial Area	1,200,000
Iron and steel:				
Direct-reduced iron		United Steel Co. B.S.C.	Hidd Industrial Area	1,500,000
Iron ore, pellets		Gulf Industrial Investment Co. E.C. (Gulf United Steel Holding Co., 100%)	Pellet plant at Hidd	11,000,000
Crude steel		United Steel Co. B.S.C.	Hidd Industrial Area	850,000
Heavy sections		do.	do.	600,000
Steel, stainless, rolled		Universal Rolling W.L.L.	do.	100,000
Hot-rolled		United Stainless Steel Co. B.S.C. (Gulf United Steel Holding Co., 100%)	do.	100,000
Ferroalloys		Bahrain Ferro Alloys B.S.C. (ETA Star Holding L.L.C., 100%)	do.	55,000
Methanol		Gulf Petrochemical Industries Co. B.S.C. (National Oil and Gas Authority, 33.3%; Petrochemical Industries Co., 33.3%; Saudi Basic Industries Corp., 33.3%)	Sitra	450,000
Natural gas:				
Extracted	million cubic meters	Bahrain Petroleum Co., B.S.C. (Closed) (National Oil and Gas Authority, 100%)	Bahrain field, Awali	13,900
Liquids:				
Butane	thousand 42-gallon barrels	Bahrain National Gas Co. B.S.C. (National Oil and Gas Authority, 75%; Arab Petroleum Investment Corp., 12.5%; Caltex Bahrain, 12.5%)	Natural gas plant at Awali	1,100
Naphtha	do.	do.	do.	1,020
Propane	do.	do.	do.	1,800
Nitrogen:				
Ammonia		Gulf Petrochemical Industries Co. B.S.C. (National Oil and Gas Authority, 33.3%; Petrochemical Industries Co., 33.3%; Saudi Basic Industries Corp., 33.3%)	Sitra	500,000
Urea		do.	do.	700,000

See footnotes at end of table.

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TABLE 2—Continued
BAHRAIN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum:				
Synthetic coke		Aluminium Bahrain B.S.C. (Bahrain Mumtalakat Holding Co., 69.38%; SABIC Industrial Investments Co. Ltd., 20.62%; others, 10%)	Sitra	600,000
Crude	thousand 42-gallon barrels	Saudi Arabian Oil Co.	Abu Saafa field, offshore	93,400 [1]
Do.	do.	Bahrain Petroleum Co., B.S.C. (Closed) (National Oil and Gas Authority, 100%)	Bahrain field, Awali	17,500
Refinery products	do.	do.	Sitra	265,000
Lube oil	do.	Bahrain Lube Base Oil Co. [National Oil and Gas Authority, 55%; Bahrain Petroleum Co., B.S.C. (closed), 27.5%; Neste Oil Corp., 27.5%]	do.	2,800
Sulfur		Bahrain Petroleum Co., B.S.C. (closed) (National Oil and Gas Authority, 100%)	do.	135,000

Do., do. Ditto. NA Not available.

[1]Production is pumped to Bahrain and subsequently refined and marketed by Bahrain Petroleum Co.

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The Mineral Industry of Iran

By Staff

The mineral industry held a very prominent role in the economy of Iran, particularly the hydrocarbon sector, which included the production of natural gas and oil, the refining of crude oil, and the distribution of hydrocarbons. According to BP p.l.c., Iran was the world's third-ranked producer of natural gas. Iran also was the world's sixth-ranked producer of crude oil and condensate (natural gas liquids) and accounted for about 4.0% of the world's output (combined). About 2% of the world's crude-oil-refining capacity was located in the country, and Iran held 18.2% of proved worldwide natural gas reserves and 9.3% of proved crude oil reserves in 2013 (BP p.l.c., 2014, p. 6, 10, 16, 20, 22).

More than 40 mineral commodities were mined and about 20 metals or mineral-related commodities were refined or manufactured in Iran. The country was estimated to account for about 6% of the world's output of gypsum; about 3% each of the world's output of barite, feldspar, and sulfur; and more than 1% each of the world's output of cement, industrial (or glass) sand, molybdenum, and nitrogen. Mineral-related issues (specifically uranium enrichment and the potential to produce fissile material for the development of a nuclear weapon) negatively affected Iran's relations with the Governments of many countries (U.S. Government Accountability Office, 2013, p. 3–4; Apodaca, 2015a, b; Crangle, 2015; Dolley, 2015; McRae, 2015; Polyak, 2015; Tanner, 2015; van Oss, 2015).

Minerals in the National Economy

Iran had an extensive mineral production and processing industry. Production, processing, transportation, and sales of crude oil and natural gas accounted for about 16% of the country's nominal gross domestic product (GDP). The mining and manufacturing sector, of which the production of cement and steel were significant components, accounted for an additional 13% of the GDP, and the construction sector, 9% (tables 1, 2; Central Bank of the Islamic Republic of Iran, 2014, p. 2).

Various sanctions had been imposed by the U.S. Government on Iran since 1995. International sanctions related to uranium-enrichment and uranium-reprocessing activities were imposed beginning in 2006 owing to concerns about the potential for the diversion of nuclear technology and the potential for Iran to recover and disseminate nuclear material (such as plutonium) from spent fuel rods. The subsequent discovery of standalone uranium enrichment facilities in Iran, which potentially could produce highly enriched uranium for nuclear weapons, resulted in additional economic sanctions. In the past few years, international sanctions had begun to affect Iran's economy significantly, especially sanctions directed at mineral sector activities (such as the production, refining, and transport of crude petroleum and metal ores), which historically have required large investments to develop the deposits and to construct facilities to process the mineral production (U.S. Government Accountability Office, 2013, p. 3–57).

In September, the Ministry of Foreign Affairs took charge of international negotiations concerning nuclear issues from the Supreme National Security Council. In November, Iran entered multilateral negotiations regarding sanctions relief with the P5+1 group of the United Nations (UN). The P5+1 group is made up of the five permanent members of the United Nations Security Council (China, France, Russia, the United Kingdom, and the United States) plus Germany; the consortium is also known as the E3+3 group. Also in November, the International Atomic Energy Agency (IAEA) and Iran signed a "Joint Statement on a Framework for Cooperation." In the joint statement, Iran agreed to cooperate with the IAEA to allow IAEA inspectors managed access to the Gchine uranium mine, to provide information on the proposed locations of 16 new nuclear powerplants, and to clarify a 2010 Iranian announcement about 10 additional uranium enrichment facilities (International Atomic Energy Agency, 2013a, 12; 2013b, p. 1–3; Rezaian and Gearan, 2013).

The U.S. sanctions included the Iran Sanctions Act of 1996, as amended; the Comprehensive Iran Sanctions, Accountability, and Divestment Act of 2010, as amended; Executive Order 13599 of February 5, 2012; Executive Order 13606 of April 22, 2012; Executive Order 13608 of May 1, 2012; Executive Order 13622 of July 30, 2012; Executive Order 13628 of October 9, 2012; and Executive Order 13645 of June 3, 2013. The National Defense Authorization Act for Fiscal Year 2013 (NDDA–2013) (Public Law 112–239), which was passed on January 2, 2013, included additional sanctions. Mineral sector activities affected by the subsection of NDAA–2013 titled the Iran Freedom and Counter-Proliferation Act of 2012 (Public Law 112–239, §§1245–1254) included the sale, supply, or transfer (directly or indirectly to or from Iran) of coal, graphite, precious metals, raw (which may include ore) or semifinished metals (such as aluminum and steel), and software for integrating industrial processes (U.S. Department of the Treasury, undated).

The European Union Council Regulation (EU) No. 267/2012 restricted European imports of Iranian crude oil and petroleum products; prohibited investment by member States in the Iranian petrochemical industry; prohibited trade by member States in diamond, gold, and precious metals with the Government of Iran; and prohibited the delivery of newly printed banknotes and coinage to the Government of Iran. The UN had adopted Resolution 1929 in 2010 in response to Iran's apparent lack of appropriate response to previous UN resolutions that obliged Iran to suspend uranium reprocessing and enrichment activities (United Nations Security Council, 2010; European Union, 2012; European Commission, 2016).

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Government Policies and Programs

The Mining Code of 1998, which was based on Articles 44 and 45 of Chapter 4 of the 1978 Constitution of the Islamic Republic of Iran, and various amendments to the Mining Code, regulate the mineral sector. The Petroleum Act of 1987 clarifies the Government's authority in the oil sector.

Production

Data on mineral production in Iran are in table 1.

Structure of the Mineral Industry

The Ministry of Industries and Mines administered all mining, smelting, and refining industries, except the oil and gas sectors, which were administered by the Ministry of Petroleum. Basic geologic exploration and most initial evaluations of the nation's mineral resources (except hydrocarbons) were performed by the Geological Survey of Iran. In March 2013, the Iranian Center for Statistics reported that there were 5,316 active mines in Iran. Most of Iran's mines were privately owned, although the Government, primarily through the Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO), controlled many of the larger capacity mining and mineral-processing companies, especially those that produced aluminum, ammonia, coal, copper, iron and steel, and salt (table 2; Statistical Center of Iran, 2014).

Mineral Trade

The Central Bank of the Islamic Republic of Iran reported that hydrocarbons accounted for about 68% of the total value of exports in 2013. Crude oil exports accounted for most of the total hydrocarbon exports, which included condensate, natural gas, and refined petroleum products. In 2013, total hydrocarbon exports were valued at about $63 billion compared with about $78 billion in 2012 and about $118 billion in 2011. The decrease was attributed to the effect of international sanctions. Iran also imported petroleum condensate, natural gas, natural gas liquids, and refined oil products, which in 2013 were valued at about $3 billion, or about 5% of total imports. In 2012, hydrocarbon imports were valued at about $4.9 billion, or about 7% of total imports; in 2011, they were valued at about $3.5 billion, or about 5% of total imports. The decrease in the value of hydrocarbon imports in 2013 was attributed to the Government's program to reduce domestic subsidies (Central Bank of the Islamic Republic of Iran, 2014, p. 13).

Outlook

Numerous production-capacity expansion projects and new mineral commodity development projects in Iran's mineral sector are planned. Historically, the implementation of many of the mineral projects proposed in the 5-year national development plans are commissioned in the final year (the fifth 5-year national development plan ends in 2015). In recent years, the availability of international funding for capital-intensive development of mineral-related projects by Government-controlled and private companies operating in Iran has been impaired owing, in part, to international economic sanctions. Some foreign investment continues to be made, primarily in the petroleum sector, by state-owned Chinese and Indian companies. Other issues (besides sanctions) that are expected to affect the Iranian mineral sector include high inflation and the relative lack of investment in the petroleum sector (Khajehpour, 2013; Rezaian, 2013; Trend News Agency, 2014; Melito, 2015, p. 3–4).

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TABLE 1
IRAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
METALS						
Aluminum:						
Bauxite, gross weight		522,018	687,000 r	847,000 r	892,000 r	788,600
Alumina[e]		210,400	236,000	233,000	227,000	245,000
Metal, primary ingot		281,300 r	303,000 r	321,900 r	336,500 r	295,000
Antimony		NA	600	600	--	400
Chromium, mine output, chromite concentrate:						
Gross weight		241,300 r	394,000 r	440,000 r	412,000 r	410,000
Cr_2O_3 content		118,250 r	169,400 r	189,200 r	192,200 r	191,100
Copper:						
Mine output:						
Ore mined (0.6% to 1.2% Cu):						
Gross weight	thousand metric tons	27,000	27,470 r	37,290 r	34,780 r	32,420
Cu content		263,000	256,700 r	258,900 r	238,000 r	222,900
Concentrate (29% to 35% Cu):						
Gross weight		750,000	760,000	940,000	950,000	750,000
Cu content		250,000	255,000	255,000	260,000	210,000
Metal:						
Smelter output, blister or anode		262,000	279,000	270,000 r	271,000 r	224,000
Refined output, cathode		210,254	221,000 r	235,000 r	213,000 r	189,000
Gold, mine output, Au content[3]	kilograms	2,000	2,000	2,200 r	2,800 r	2,500
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand metric tons	27,435 r	31,029 r	35,843 r	39,783 r	48,175
Fe content	do.	13,515 r	15,200 r	17,600 r	19,500 r	23,600
Metal:						
Pig iron	do.	2,400	2,540 r	2,242 r	2,143 r	2,007
Direct-reduced iron	do.	8,200	9,350 r	10,368 r	11,582 r	14,458
Steel, crude, ingots and castings	do.	11,000 r	11,995 r	13,197 r	14,463 r	15,422
Lead, mine output, concentrate:						
Gross weight		56,000 r	67,000 r	62,000 r	75,000 r	85,000
Pb content		27,000 r	32,000	29,600 r	35,600 r	40,300
Manganese, mine output (30% to 35% Mn):						
Gross weight		125,506	126,000 r	228,000 r	195,000 r	207,000
Mn content		45,000	42,500 r	77,200 r	66,100 r	70,200
Mercury		NA	2	2	--	10
Molybdenum, mine output, concentrate:						
Gross weight		4,447	6,600 r	6,000 r	6,300 r	6,200
Mo content		2,500	3,676 r	3,365 r	3,516 r	3,471
Silver		106	106	101	96	85
Zinc:						
Mine output, concentrate:						
Gross weight		150,000	260,000 r	280,000 r	280,000 r	264,000
Zn content		72,048	128,000 r	138,000 r	138,000 r	130,000
Metal		65,000	120,000 r	132,000 r	132,000 r	120,000
INDUSTRIAL MINERALS						
Arsenic		100	13	98	101	110
Barite		365,000 r	322,000 r	300,000 r	315,000 r	360,000
Boron, borax		1,000 r	1,060 r	1,044	3,000 r	914
Cement, hydraulic	thousand metric tons	50,000	55,000	66,000	70,250 r	68,700

See footnotes at end of table.

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TABLE 1—Continued
IRAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2009	2010	2011	2012	2013
INDUSTRIAL MINERALS—Continued						
Clays:						
Bentonite		387,437	542,900 r	422,000 r	427,000 r	397,100
Industrial clays		530,000	550,000	550,000	550,000	550,000
Kaolin		907,487	761,500 r	762,000 r	800,000 r	946,400
Diatomite		2,000 r	3,000 r	--	--	9,500
Feldspar		634,503	533,100 r	576,600 r	1,100,000 r	1,313,200
Fluorspar		71,409	59,831 r	55,976	80,000 r	69,828
Gemstones, turquoise[e]	kilograms	19,000	20,000	20,000	21,000	21,000
Graphite		NA	360	360	--	--
Gypsum	thousand metric tons	17,700 r	13,672 r	15,353 r	14,179 r	15,800
Industrial or glass sand (quartzite and silica)[e]	do.	1,500	1,500	1,500	1,500	1,500
Lime[e]	do.	2,600	2,700	2,800	2,800	2,800
Magnesite		130,575	173,500 r	172,700 r	143,000 r	170,700
Mica		6,797	2,860	7,130	7,000	7,000
Nitrogen:						
N content of ammonia		2,000,000	2,500,000	2,500,000	2,500,000	2,500,000
N content of urea		1,300,000	1,600,000	1,600,000	1,600,000	1,600,000
Perlite		47,000	19,200	20,000	30,000	55,100
Phosphate rock:						
Ore		250,000 r	362,000 r	370,000 r	370,000 r	380,000
P_2O_5 content		75,000 r	108,700 r	110,000 r	110,000 r	113,600
Salt		2,816,235	2,997,400 r	2,714,700 r	2,962,000 r	2,078,682
Stone, construction and building, crushed[e, 4]	thousand metric tons	25,000	26,000	26,000	27,000	27,000
Strontium minerals, celesite		15,396	--	40,000	20,000	--
Sulfur:						
Byproduct of petroleum and natural gas		1,500,000	1,780,000 r	1,575,000 r	2,000,000 r	2,100,000
Byproduct of metallurgical processing, S content of acid		70,000	80,000	75,000 r	90,000	95,000
Total		1,570,000	1,860,000 r	1,650,000 r	2,090,000 r	2,195,000
Talc		66,383	62,672 r	58,987	116,000 r	92,958
Vermiculite[e]		--	1,200	1,200	1,200	1,200
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Hard	thousand metric tons	2,181	1,045 r	1,066 r	1,044 r	858
Lignite	do.	1,212 r	2,324 r	2,327 r	2,820 r	2,800
Coke	do.	1,048 r	984 r	1,052 r	940 r	1,059
Gas, natural:						
Gross	million cubic meters	210,335 r	220,123 r	224,122 r	231,332 r	228,887
Dry	do.	175,742 r	187,357 r	188,753 r	202,431 r	199,293
Gas plant liquids	thousand 42-gallon barrels	140,000	145,000	145,000	150,000	156,000
Petroleum:						
Crude	do.	1,298,342 r	1,293,560 r	1,305,240 r	1,365,027 r	1,304,985
Refinery products:						
Motor gasoline	do.	121,399 r	126,400 r	112,603 r	152,789 r	166,331
Kerosene	do.	43,508 r	47,523 r	42,669 r	45,443 r	45,443
Distillate fuel oil	do.	203,050 r	206,408 r	218,307 r	202,794 r	214,839
Residual fuel oil	do.	180,456 r	172,280 r	177,828 r	173,850 r	187,172
Other	do.	81,650 r	83,695 r	86,870 r	86,505 r	86,505
Total	do.	630,063 r	636,306 r	638,277 r	661,381 r	700,290
Uranium		7 e	7	12	15	40

eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. rRevised. do. Ditto. -- Zero.

[1]Table includes data available through April 14, 2016.

[2]In addition to the commodities listed, the following may have been produced, but information is inadequte to make reliable estimates of output: bromine, caustic soda, crude construction materials (such as sand and shell), dimension stone, dolomite, ferroalloys, hafnium oxide, ilmenite, iron oxide pigments, refined lead, limestone, nepheline syenite, pumice, selenium, silicomanganese, soda ash, uranium, zeolites, and zirconium metal.

[3]Includes gold recovered from the Mouteh gold mine and from the Sarcheshmeh copper complex.

[4]Includes marble and travertine.

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TABLE 2

IRAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013[1, 2]

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina	Iran Alumina Co. (Government)	Northeast of Jajarm, Khorasan-e Shomali Province	280
Aluminum	Iran Aluminium Co. [Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)[3] majority interest, and a joint venture of Industrial Development Investment Co. and a subsidiary of Mehr Finance & Credit Institution, 40%]	Arak, Markazi Province	190
Do.	Almahdi Hormozal Aluminium Co.	Bandar Abbas, Hormozgan Province	257
Bauxite	Iran Alumina Co. (Government)	Jajarm Mine, about 15 kilometers northeast of Jajarm	500
Cement	Abadeh Cement Co.	Abadeh, Fars Province	175
Do.	Abyek Cement Co. (Fars & Khouzestan Cement Co.)	Abyek, Qazvin Province, 80 kilometers northwest of Tehran	5,100
Do.	Anarak Special Cement Co.	Anarak, Markazi Province	500
Do.	Ardebil Cement Co. (Espandar Cement Investment Co.)	Namin, Ardabil Province	1,050
Do.	Ardestan Cement Co.	North of Esfahan, Esfahan Province	1,000
Do.	Azar-Abadegan Khoy Cement Co.	West Azerbaijan Province	1,095
Do.	Behbahan Cement Co. (Fars & Khouzestan Cement Co.)	Behbahan, Khuzestan Province	960
Do.	Benvid White Cement Co. (Bank Melli Iran Investment Co.)	Benvid, Esfahan Province	175
Do.	Bojnourd Cement Plant (Fars & Khouzestan Cement Co.)	About 37 kilometers from Bojnourd, Khorasan-e Shomali Province	700
Do.	Bushehr Cement Co. (Dashtestan Cement)	Borazjan, Bushehr Province	1,000
Do.	Darab Cement Co. [General public (Justice shares), 50%, and Bank Melli Iran Investment Co., 29%]	About 190 kilometers southeast of Shiraz, Fars Province	1,100
Do.	Doroud Cement Co. (Fars & Khouzestan Cement Co.)	Doroud, Lorestan Province	1,400
Do.	Ekbatan Cement Co. (Espandar Cement Investment Co.)	Ekbatan, Tehran Province	175
Do.	Estahban Cement Co.	20 kilometers west of Estahban, Fars Province	350
Do.	Faraz Firouzkhuh Cement Co. (Espandar Cement Investment Co.)	About 180 kilometers northeast of Tehran	1,200
Do.	Fars Cement Co. (Fars & Khouzestan Cement Co.)	Shiraz, Fars Province	2,000
Do.	Fars Nov Cement Co. (Fars & Khouzestan Cement Co.)	About 65 kilometers southeast of Shiraz, Fars Province	1,000
Do.	Firozkuh	Firouzkoh	1,100
Do.	Ghaen Cement Co. (Cement Investment and Development Co., 26%, and Bank Melli Iran Investment Co., 14%)	Qayen (Ghaen), Khorasan-e Jonubi Province	770
Do.	Gharb Cement Co. (Fars & Khouzestan Cement Co.)	Kermanshah, Kermanshah Province	700
Do.	Hegmatan Cement Co. (Tehran Cement Co., 79%)	East of Razan, Hamadan Province	1,000
Do.	Hormozgan Cement Co. (OMID Investment Co.)	About 75 kilometers west of Bandar Abbas	2,200
Do.	Ilam Cement Co. (Tehran Cement Co., 47%)	Northeast of Ilam, Ilam Province	700
Do.	Isfahan Cement Co.	Esfahan, Esfahan Province	1,100
Do.	Karoon Cement Co.	Near Masjed Soleyman, Khuzestan Province	1,100
Do.	Kavir Kashan Cement Co. (Espandar Cement Investment Co.)	Near Kashan, Esfahan Province	660
Do.	Kerman Cement Co. (Bank Melli Iran Investment Co., 38%)	Kerman, Kerman Province	1,260
Do.	Khash Cement Co. (Fars & Khouzestan Cement Co.)	Khash, Sistan va Baluchestan Province	730 [e]
Do.	Khazar Cement Co. (Fars & Khouzestan Cement Co.)	About 80 kilometers northwest of Qazvin, Qazvin Province	1,200
Do.	Khouzestan Cement Co. (Fars & Khouzestan Cement Co.)	Ramhormoz, Khuzestan Province	1,100 [e]
Do.	Kohkiloye Yasuj Cement (State Retirement Organization[3] and Fars & Khouzestan Cement Co.)	Behbehan, near Deh Dasht, Kohkiloye, Kohgiluyeh va Bowyer Ahmad Province	240
Do.	Kordestan Cement Co. (Ghadir Investment Co.)	North of Bijar, Kordistan Province	1,000
Do.	Lamerd Cement Co.	Lamerd, Fars Province	1,205
Do.	Lar-e Sabzevar Cement Co.	Sabzevar, Khorasan-e Razavi Province	1,100
Do.	Loshan Cement Co. (Tehran Cement Co., 66%)	Loshan, Gilan Province	100
Do.	Mazandaran Cement Co. (Bank Melli Iran Investment Co., 60%)	Neka, Mazandaran Province	1,600
Do.	Neyriz White Cement Co. (Fars & Khouzestan Cement Co.)	Neyriz, Fars Province	160
Do.	Omran Anarak Cement Co.	Delijan, Markazi Province	1,030
Do.	Qeshm Cement Co.	Qeshm Island, Hormozgan Province	250

See footnotes at end of table.

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TABLE 2—Continued
IRAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013[1, 2]

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement—Continued	Sarooj Bushehr International Co.	Kangan, Bushehr Province	1,600
Do.	Saveh Grey Cement Co. (Fars & Khouzestan Cement Co.)	Saveh, Markazi Province	2,200
Do.	Saveh White Cement Co. (Fars & Khouzestan Cement Co.)	do.	350
Do.	Sepahan Cement Co. (Ghadir Investment Co.)	Mobarekeh, Esfahan Province	2,300
Do.	Shahroud Cement Co. (Fars & Khouzestan Cement Co.)	Shahroud, Semnan Province	600
Do.	Sharg Cement Co. (Ghadir Investment Co.)	Mashhad, Khorasan-e Razavi Province	1,600
Do.	Shemal Cement Co. (Bank Melli Iran Investment Co., 59%)	Pardis, Tehran Province	880
Do.	Soufian Cement Co. (Fars & Khouzestan Cement Co. and Social Security Organization Investment Co.)	About 33 kilometers northwest of Tabriz, East Azerbaijan Province	1,500
Do.	Tehran Cement Co. (Ghadir Investment Co.)	Tehran, Tehran Province	6,000
Do.	Tis Chabahar Cement Co.	Chabahar, Sistan and Baluchestan Province	6,000
Do.	Urmia Cement Co. (Fars & Khouzestan Cement Co.)	Orumiyeh, West Azerbaijan Province	1,000
Do.	Urumieh White Cement Co.	do.	180
Do.	Yazd Bohrouk Cement Co.	Yazd, Yazd Province	1,100
Do.	Zanjan Cement Co. (Fars & Khouzestan Cement Co.)	Zanjan, Zanjan Province	600
Do.	Zarveh Torbat Cement Co.	Torbat-Heydareh, Khorasan-e Razavi Province	1,100
Chromite	Faryab Mining Co.	Faryab Mine and processing plant, Minab, Hormozgan Province	180 e
Do.	Esfandaghe Mines Co.	Abdasht Mine, Kerman Province; Suqan (Saboughan) Mine, Kerman Province; Processing plant at Esfandaghe, Kerman Province	30
Do.	NA	Furumad Mine, Shahrud, Semnan Province; Gaft processing plant, Semnan Province	6
Do.	NA	Mir Mahmud Mine, Mayami, Semnam Province	6
Do.	NA	Dumak Mine, Zahedan, Sistan va Baluchestan Province	2
Coke	Isfahan Steel Co. [Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)][3]	Plant about 40 kilometers southwest of Esfahan, Esfahan Province	900
Do.	Middle East Coke Production Co. [[Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)][3]	NA	800
Do.	Tabas Coke Production Co. [Iranian Mines and Mining Development and Renovation Organization (IMIDRO)][3]	NA	450
Do.	Zarand Iranian Steel Co.	Zarand, Kerman Province	400
Coal			
Do.	National Iranian Copper Industries Co. (NICICO) [Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)][3]	Eastern Parvadeh Mine, Tabas Province	600
Do.	do.	Khomroud Mine, Kerman Province	450
Do.	do.	Parvadeh 4 Mine, Tabas Province	450
Do.	do.	Parvadeh 2 and 3 Mines, Tabas Province	500
Do.	do.	Kordobad Mine, Savadkouh Province	230
Do.	do.	Hashouni and Pabdana Mines, Kerman Province	150
Do.	do.	Takht and Vatan Mines, Alborz Province	150
Copper:			
Concentrate	National Iranian Copper Industries Co. (NICICO) [Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)][3]	Sarcheshmeh Mine, south of Rafsanjan, Kerman Province	670
Do.	do.	Sungun copper mine, East Azerbaijan Province	150
Do.	do.	Miduk copper mine, Kerman Province	150
Do.	do.	Qal'eh Zari Mine, about 120 kilometers southwest of Birjand, Khorasan-e Jonubi Province	10
Do.	do.	Chah Firozeh, Chah Messi, Darehzar, and Eijo copper mines, Kerman Province	NA
Do.	Private cooperatives	Chah Musa Mine and Qal'eh Sukhteh, Semnan Province	5

See footnotes at end of table.

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TABLE 2—Continued
IRAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013[1, 2]

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper—Continued:				
Smelter output		National Iranian Copper Industries Co. (NICICO) [Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)][3]	Smelter, Sarcheshmeh copper complex, south of Rafsanjan, Kerman Province	158
Do.		do.	Smelter near Khatoonabad, Kerman Province	80
Refined metal		do.	Refinery, Sarcheshmeh copper complex, south of Rafsanjan, Kerman Province	210
Do.		do.	Electrowon plant, Sarcheshmeh copper complex, south of Rafsanjan, Kerman Province	14
Gemstones, turquoise		NA	Neyshabur Mine, Khorasan-e Razavi Province	6 e
Gold:				
Ore	kilograms	Iran Gold Co.	Muteh Mine (Chah Khaton and Senjedeh pits), Esfahan Province, and Kuh-e-Zar Mine, Semnan Province	600
Do.	do.	Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)][3]	Zarshouran Mine, 31 km north of Takab, West Azerbaijan Province	NA
Do.	do.	National Iranian Copper Industries Co. (NICICO) [Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)][3]	Coproduct of production from various copper mines	600
Do.	do.	Pooya Zarcan Agh Darreh	Agh Darreh	1,000 [4]
Do.	do.	Artisanal placer operations	Neyshabur area, Khorasan-e Razavi Province	NA
Metal[5]	do.	National Iranian Copper Industries Co. (NICICO) [Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)][3]	Sarcheshmeh copper complex, south of Rafsanjan, Kerman Province	500
Iron and steel:				
Iron ore		Chadormalu Mining and Industrial Co. [Omid Investment Management Corp., 37%; Mines and Metals Development Investment Co., 15%; Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO),[3] 8%]	Chadormalu Mine, 80 kilometers north of Bafgh, Yazd Province	6,500
Do.		Gol-e-Gohar Iron Ore Co. [Omid Investment Management Corp., 39%; Mines and Metals Development Investment Co., 28%; Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO),[3] 18%]	Gol-e-Gohar Mine, about 50 kilometers southwest of Sirjan, Kerman Province	3,800
Do.		Iran Central Plateau Iron Ore Co. [National Iranian Steel Co. (NISCO), 100%][6]	Choghart Mine, Bafgh, Yazd Province	7,400
Do.		Iranian Minerals Production and Supply Co. (IMPASCO) [Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)[3]]	Jalal Abad Mine, about 40 kilometers northwest of Zarand	1,700
Do.		NA	Chah Gaz Mine, Yazd Province	NA
Do.		NA	Mishdovan Mine, Yazd Province	NA
Do.		Sangan Iron Ore Co. (National Iranian Steel Co., 100%)[3]	Sangan (Songun) Mine, about 140 kilometers southeast of Torbat e-Heydariyeh, Khorasan-e Razavi Province	2,000
Do.		About 20 small privately owned mines	NA	1,000 e
Iron:				
Cast iron		Zagros Steel Co. (Government, majority interest)	Foundry in Kordistan Province	70
Iron metal		Mobarekeh Steel Co. [Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)][3] majority interest; Social Security Organization,[3] 10%; a subsidiary of Mehr Finance & Credit Institution, 5%, and the Steel Employees Fund, 5%]	Direct-reduction iron plant (Midrex® process) about 50 kilometers southwest of Esfahan, Esfahan Province	4,000
Do.		Khouzestan Steel Co. [Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO),[3] majority interest]	Direct-reduction iron plant (HYL I, Midrex®, and Purofer processes), Ahwaz, Khuzestan Province	3,200

See footnotes at end of table.

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TABLE 2—Continued
IRAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013[1,2]

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Iron and steel—Continued:			
Iron—Continued:			
Iron metal—Continued	Hormozgan Steel Complex [National Iranian Steel Co. (NISCO)[6] and partners]	Direct-reduction iron plant (Midrex® process)	850
Do.	Isfahan Steel Co. [Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)][3]	Direct-reduction iron plant (Ghaem process) about 40 kilometers southwest of Esfahan, Esfahan Province	600
Steel, crude	Mobarekeh Steel Co. [Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)][3] majority interest; Social Security Organization,[3] 10%; a subsidiary of Mehr Finance & Credit Institution, 5%; the Steel Employees Fund, 5%]	Plant about 50 kilometers southwest of Esfahan, Esfahan Province	4,200
Do.	Khouzestan Steel Co. [Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO),[3] majority interest]	Plant at Ahwaz, Khuzestan Province	2,600
Do.	Isfahan Steel Co. [Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)][3]	Plant about 40 kilometers southwest of Esfahan, Esfahan Province	2,200
Do.	Khorasan Steel Co. [Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)[3] majority interest, and a Government pension fund, 40%]	Plant at Neyshabur, Khorasan-e Razavi Province	650
Do.	Vian Steel Melting and Casting Co.	Plant, about 42 kilometers of Hamadan, Hamadan Province	600
Do.	Meibod (Maybod) Steel Co. (Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)],[3] 50%	About 15 kilometers southwest of Meybod, Yazd Province	300
Magnesite	Birjand Refractory Mining Co. (Iranian Refractories Procurement & Production Co.)	Hoz Sefid, Shirkuhak, and Torshak Mohammadi Mines, about 50 kilometers southeast of Birjand, Khorasan-e Jonubi Province	NA
Molybdenum, concentrate	National Iranian Copper Industries Co. (NICICO) [Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)][3]	Molybdenum plant, Sarcheshmeh copper complex, south of Rafsanjan, Kerman Province	8
Do.	do.	Molybdenum plant, Sungun copper complex, East Azerbaijan Province	3
Natural gas billion cubic meters	National Iranian Oil Co. (Government, 100%)	Associated gas from company oilfields	96
Do. do.	do.	Aghar, Dalan, Kangan, and Nar gasfields	57
Do. do.	Pars Oil and Gas Co. (National Iranian Oil Co., 100%)[3]	South Pars gasfields, offshore	32[7]
Petroleum:			
Crude million 42-gallon barrels	National Iranian Oil Co. (Government, 100%)	Onshore oilfields include the Agha Jari, the Ahwaz-Asmari, the Bangestan, the Hakimeh, the Gachsaran, the Karanj, the Marun, the Pazanan, and the Rag-e-Safid. Offshore oilfields include the Abouzar and the Salman	1,400
Do. do.	National Iranian Oil Co. and buyback contract joint venture of Shell Iran Nowrooz/Soroosh Development (70%), JJI S&N B.V. (20%), and Iranian Offshore Engineering & Construction Co. (10%)	Nowrooz and Soroosh fields, offshore	75
Do. do.	National Iranian Oil Co. and buyback contract joint venture of Total S.A. (55%) and Eni SpA (45%)	Doroud field, offshore	65
Do. do.	National Iranian Oil Co. and buyback contract joint venture of Total S.A. (70%) and PETRONAS Carigali International Sdn Bhd (30%)	Sirri A and E fields, offshore	40
Do. do.	National Iranian Oil Co. and buyback contract joint venture of Total S.A. (60%) and Naftiran Intertrade Co. (40%)	Darquain field, onshore	17

See footnotes at end of table.

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TABLE 2—Continued
IRAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013[1,2]

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum:			
Refined products thousand 42-gallon barrels per day	National Iranian Oil Refining and Distribution Co. (NIORDC) (Government, 100%)	Refinery at Abadan	399
Do. do.	do.	Refinery at Esfahan	375 [8]
Do. do.	do.	Refinery at Bandar Abbas	284 [8]
Do. do.	do.	Refinery at Tehran	245 [8]
Do. do.	do.	Refinery at Arak	242
Do. do.	do.	Refinery at Borzuyeh	120
Do. do.	do.	Refinery at Tabriz	110
Do. do.	do.	Refinery at Shiraz	56 [8]
Do. do.	do.	Refinery at Lavan Island	48 [8]
Do. do.	do.	Refinery at BooAli Sina	34
Do. do.	do.	Refinery at Kermanshah	22
Do. do.	do.	Refinery at Aras 2	10
Do. do.	do.	Refinery at Booshehr	10
Do. do.	do.	Refinery at Aras 1	5
Do. do.	do.	Refinery at Yazd	3
Phosphate rock	Esfordi Phosphate Complex (Iran Minerals Production & Supply Co.)[3]	About 35 kilometers northeast of Bafgh, Yazd Province	500
Titanium, ilmenite	Kahnuj pilot plant [Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO)][3]	Daregaz placer and Kahnuj titanium dioxide processing plant	NA
Uranium metric tons	Atomic Energy Organization of Iran (Government)	Saghand Mine, about 125 kilometers northeast of Yazd, Yazd Province	58
Do. do.	do.	Gchine Mine, near Bandar Abbas, Hormozgan Province	21 [e]
Zinc:			
Ore	Iran Zinc Mine Development Co.	Angouran open pit mine, Dandi, Zanjan Province	500 [9]
Do.	BAMA Co. (IranKouh)	Irankouh complex (Gooshfil underground and Tappeh Sorkh open pit mines, about 20 kilometers southeast of Esfahan, Esfahan Province, and Kolah Darvazeh Mine, south of Esfahan, Esfahan Province)	190 [9]
Do.	Bafgh Mining Co.	Kushk Mine, Yazd Province	120 [9]
Do.	Ber-Oner Tehran Co.	Emarat Mine, about 25 kilometers southwest of Arak, Markazi Province	100 [9]
Refined metal	Bafgh Zinc Co. (Iran Zinc Mine Development Co.)	West of Bafgh, Yazd Province	30
Do.	Qeshm Zinc Smelter Co. (affiliate of Calcimine Co.)	Kaveh Industrial Zone, Qeshm Island, Hormozgan Province	20
Do.	Calcimine Co. (Iran Zinc Mine Development Co.)	Dandi (Angouran) plant, Zanjan Province	18
Do.	Faravari Mavad Madani Iran Co. (Iran Zinc Mine Development Co.)	Dandi, Zanjan Province	18
Do.	National Iranian Lead and Zinc Co. (Iran Zinc Mine Development Co.)	About 12 kilometers east of Zanjan, Zanjan Province	15
Do.	Bandar Abbas Zinc Production Co. (affiliate of Calcimine Co.)	Bandar Abbas, Hormozgan Province	13
Do.	Zanjan Zinc Smelter Co. (affiliate of Calcimine Co.)	Zanjan, Zanjan Province	5

[e]Estimated. Do., do. Ditto. NA Not available.
[1]About 3,000 mines that are located in Iran are active. About 65% of the active mines and quarries produce building and construction materials, such as aggregate, sand, and stone.
[2]Data were augmented by input from the Iranian National Committee of the World Mining Congress.
[3]Government owned.
[4]Operations suspended.
[5]Recovered from Sar Chemesh copper plant slimes.
[6]A subsidiary of state-owned Iranian Mines and Mining Industries Development and Renovation Organization (IMIDRO).
[7]May include basic sediment and condensate.
[8]Held 95% equity interest.
[9]Includes lead and zinc ores.

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The Mineral Industry of Iraq

By Mowafa Taib

In 2013, Iraq was the world's eighth-ranked producer of crude oil. The country produced 3.14 million barrels per day (Mbbl/d) of crude oil and condensate and accounted for 3.7% of the world's total output. Iraq exported 2.39 Mbbl/d of crude oil in 2013 and was the world's fourth-ranked crude oil exporter after Saudi Arabia (7.57 Mbbl/d), Russia (4.71 Mbbl/d), and the United Arab Emirates (2.70 Mbbl/d). The country's proved crude oil reserves, which were estimated by the Government to be 150.1 billion barrels (Gbbl), accounted for 8.9% of the world's total reserves and ranked Iraq as having the fifth largest petroleum reserves in the world after Venezuela (298.3 Gbbl), Saudi Arabia (265.9 Gbbl), Canada (174.3 Gbbl), and Iran (157.0 Gbbl). Iraq's proved natural gas reserves were estimated to be 3.6 trillion cubic meters, or 1.9% of the world's total reserves (BP p.l.c., 2014, p. 6, 8; Organization of the Petroleum Exporting Countries, 2014, p. 55).

According to a recent study published in the Houston Geological Society Bulletin, Iraq has the potential to become the world's leader in hydrocarbon production once its greatly underestimated resources are developed and put into production (Holzman, 2013, p. 23). The study estimates Iraq's hydrocarbon reserves to be 230 Gbbl in the 84 oilfields that had been identified as of the end of 2004. More-recent crude oil and natural gas discoveries added an estimated 9 to 14 Gbbl of crude oil, 25.5 billion cubic meters of natural gas in the Kurdistan region of Iraq, and about 6 trillion cubic meters of natural gas in the Western Desert of Iraq to the country's reserves. In 2013, only 29 of the 89 major oilfields were in production (Holzman, 2013, p. 23).

Although Iraq did not mine any metal commodities in 2013, it produced several industrial mineral commodities in modest quantities for local consumption. These mineral commodities included bentonite, cement, clay, gypsum, limestone, nitrogen and phosphate fertilizers, phosphate rock, salt, sand and gravel, silica sand, and sulfur (table 1). The Ministry of Industry and Minerals (MIM) of Iraq estimated the proved mineral resources in the country to be 10 billion metric tons (Gt) of phosphate rock; 8 Gt of limestone; 1.2 Gt of kaolinitic clays; 600 million metric tons (Mt) of native sulfur; 330 Mt of dolomite; 130 Mt of gypsum; 75 Mt of quartz sand; 60 Mt of ironstone; 50 Mt of halite salt; 22 Mt each of bentonite, glauberite, and montmorillonitic clays; 16 Mt of quartzite; 10 Mt of flint clay; 2.3 Mt of feldspathic sandstones; and 1.8 Mt of porcelanite, as well as undetermined resources of attapulgite, barite, bauxite, copper, lead, marble, sand and gravel, sandstone, and zinc (Ministry of Industry and Minerals, 2012).

Minerals in the National Economy

Iraq's gross domestic product (GDP) increased in real terms by only 4.2% in 2013 compared with revised increases of 10.3% and 10.2% in 2012 and 2011, respectively. The Government revenue from the hydrocarbon sector accounted for 44.6% of the GDP. The value of Iraq's petroleum exports, which accounted for more than 95% of the country's total exports, decreased by 5% in 2013 to $89.6 billion from $94.3 billion in 2012. The Organization of the Petroleum Exporting Countries (OPEC) Reference Basket price for Iraq's Basra light crude averaged $103.60 per barrel in 2013 compared with $107.96 per barrel in 2012. The near-total dependence on petroleum export revenues and lack of economic diversity made the country susceptible to petroleum shocks, such as sharp changes in crude oil prices on the international markets. Iraq was the leading importer of cement and iron and steel in the Middle East region and the world's ninth-ranked importer of iron and steel in 2013 (International Monetary Fund, 2013, p. 13; Organization of the Petroleum Exporting Countries, 2014, p. 17, 22, 55, 82; World Steel Association, 2014, p. 25).

Government Policies and Programs

In 2013, the Iraq Geological Survey (Geosurv-Iraq) continued to promote 12 investment projects in the industrial mineral sector throughout the country and called for investors to develop mining operations under Investment Law No. 13 of 2006 and its modifications and the Law of Mineral Investment No. 91 of 1988. These potential projects included phosphate rock mining and beneficiation at the Al Hirri Wadi in Al Anbar Governorate and the Swab Wadi; a mining and processing facility for native sulfur deposits at Lazzaga and Mishraq in Ninawa Governorate; a silica sand production plant in Al Anbar Governorate; a feldspar concentrate plant from feldspathic sandstone in An Najaf Governorate; a sodium sulfate production plant to process glauberite, which is associated with gypsum and clays, at Shari Saltern in Salah ad Din Governorate; a sodium carbonate production plant that uses the Solvay process in Al Anbar Governorate; a plant to produce alumina from kaolin using the lime-soda sinter process in Al Anbar Governorate; a ceramic tile and tile-brick plant in Al Anbar Governorate; gypsum mines in Al Anbar, Ninawa, and Wasit Governorates; and a chalk (pure calcium carbonate) mine at the Wadi Al Ghadaf (Iraq Geological Survey, 2014).

As of yearend 2013, a draft of the gas and oil legislation known as the Hydrocarbon Law, which was first proposed in 2007, remained stalled because of disagreements among Iraqi parties on wider political issues, including oil revenue sharing. The proposed law would create an oil and gas council to oversee the country's oil and gas sector and would establish the Iraq National Oil Co. The proposed law also contains arrangements for oil revenue sharing through the creation of an Oil Revenue Fund and a Future Fund. The Government was also planning to issue a new mining law that would attract investors to develop the country's industrial mineral resources.

The Federal Government of Iraq had continued to be engaged in disputes with the Kurdistan Regional Government (KRG;

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the ruling body of the federated region in northern Iraq) with respect to oil exports, revenue, and control of land in Diayla, Kirkuk, Ninawa, Salah ad Din, and Wasit Governorates. The Federal Government deemed all crude-oil-related contracts with the KRG illegal, including those signed by major oil companies such as Chevron Corp. and Exxon Mobil Corp. (both of the United States) and Total S.A. (of France), and considered them breaches of existing contracts with Iraq's Ministry of Oil (Devine and Tiller, 2014, p. 11). The Federal Government also was engaged in disputes with the Provincial government of Al Anbar with regard to the development of phosphate rock resources and cement plants in the Al Anbar Governorate (Iraq Business News, 2012).

Production

Data on mineral production are listed in table 1.

Structure of the Mineral Industry

Investment Law No. 13 of 2006 and its modifications and the Law of Mineral Investment No. 91 of 1988 govern mineral sector investment in Iraq. The Mineral Investment Division of Geosurv-Iraq monitors mineral investment operations, environmental protection, and exploration for and production of industrial minerals in Iraq by supplying information, promoting mining projects in both the private and public sectors, and conducting environmental impact studies.

The Ministry of Oil manages activity in Iraq's hydrocarbon sector through a number of state-owned oil companies. The upstream companies included Iraq Drilling Co., Midland Oil Co., Missan Oil Co., North Oil Co., Oil Exploration Co., Oil Project Co., and South Oil Co. The downstream companies included Gas Filling Co., Midland Refinery Co., North Refinery Co., Oil Marketing Co., Oil Pipeline Co., Oil Products Distribution Co., Oil Tanker Co., South Gas Co., South Refinery Co., and State Oil Marketing Organization. Several international oil companies were also working with Iraq's state-owned oil companies to develop Iraq's crude oil and natural gas fields. These companies included, BP p.l.c., of the United Kingdom; China National Petroleum Corp. (CNPC) and CNOOC Ltd. (both of China); Eni S.p.A. of Italy; ExxonMobil of the United States; Gazprom OAO and Lukoil Oil Co. (both of Russia); Petronas Carigali International Sdn Bhd, of Malaysia; Royal Dutch Shell plc of the Netherlands; and Sonangol E.P. of Angola (table 2).

The MIM administered the activity of the hard rock minerals sector through several state-owned companies, including General Company for Phosphate, Iraqi Cement Co., State Company for Iron and Steel, Mishraq Sulphur State Co., Northern Cement State Co., Southern Cement State Co., and State Company for Southern Fertilizer Industry. Geosurv-Iraq produced industrial minerals, including bentonite, clays, feldspar, ironstone, kaolin, salt, and construction and silica sand. In recent years, private companies started to produce cement, gypsum, iron and steel, and other construction materials, especially in the Kurdistan region of Iraq (table 2; Iraq Geological Survey, 2014).

In northern Iraq, the KRG adopted its own hydrocarbon law on August 9, 2007, and awarded 50 crude oil and natural gas exploration and production licenses to more than 40 international oil companies by yearend 2013 based on production-sharing contracts, which include an initial 5-year exploration period followed by a 20-year development period. The list of U.S. companies that were involved in oil exploration and production in northern Iraq included Aspect Energy LLC, Chevron, ExxonMobil, Hess Corp., Hillwood International Energy L.P., HKN Energy Ltd., Hunt Oil Co., Impulse Energy Corp., Marathon Petroleum Corp., Murphy Oil Corp., Prime Oil Co., Texas Keystone Inc., and Viking International (a subsidiary of Viking Services). Canadian companies included Forbes and Manhattan, Ground Star Resources Ltd., Longford Energy Inc., NIKO Resources, Sharman Petroleum, Talisman Energy Inc., Vast Exploration Inc., and Western Zagros Resources Ltd. Companies from the United Kingdom included First Reserve Corp., Heritage Oil plc., Niko Resources Ltd., Norbest Ltd., Perenco Oil and Gas, Pet Prime International Oil Co. Ltd., and Sterling Energy p.l.c. Turkish companies included Doğan Enerji, Genel Enerji A.S., Petroleum Products International Exploration and Production Inc. Companies from the Republic of Korea included Daesung Corp., Korea National Oil Corp. (KNOC), Le Meilleur Co. Ltd., Majuko Corp., Samchully Co., SK Energy Co. Ltd., and UI Energy Corp. Other companies that operated in the area included Crescent Petroleum and Dana Gas (both of the United Arab Emirates); DNO International ASA of Norway; Hungarian Oil and Gas Public Ltd. Co. (MOL); Komet Group of Moldova; Maersk Oil Co. of Denmark; Oil Search Ltd. of Papua New Guinea; OMV Aktiengesellschaft of Austria; Petroceltic International p.l.c. of Ireland; Reliance Industries Ltd. of India; Repsol Oil Co. of Spain; and Total of France (Ministry of Natural Resources of Kurdistan Regional Government—Iraq, 2014).

Mineral Trade

Iraq was one of the world's top exporters of crude oil in 2013. The volume of its crude oil and petroleum products exports increased slightly by 1.2% to 2.455 Mbbl/d in 2013 from 2.425 Mbbl/d in 2012. The country was also one of the world's top importers of iron and steel products in 2013, and it was the ninth-ranked importing country of steel in the world. Iraq's steel products imports amounted to 4.5 Mt compared with 4.0 Mt in 2012. Iraq's trade with Iran reached $12 billion in 2013, which was the same as the value of its trade with Turkey (Al-Hayat, 2014; Organization of the Petroleum Exporting Countries, 2014, p. 82).

U.S. exports to Iraq were valued at $2 billion in 2013, of which $338 million was for civilian and military aircraft; $260 million, for vehicles; $257 million, for drilling and oilfield equipment; $163 million, for industrial engines; $109 million, for industrial machines; $101 million, for measuring, testing, and control instruments; $96 million, for power generators; and $51 million, for excavation machinery. U.S. imports from Iraq, which peaked in 2012 and were almost entirely crude oil imports, decreased by 31% to $13.3 billion from about $19.3 billion in 2012. The decrease was attributed to a general decrease in imports of crude oil by the United States because of increased domestic production (U.S. Census Bureau, 2014).

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Commodity Review

Metals

Iron and Steel.—Iraq's iron and steel sector attracted several international steel companies and investors because of the increased demand for steel products to satisfy the country's needs in the construction and hydrocarbon sectors. Iraq's steel imports had been increasing in recent years; the country imported 4.5 Mt of semifinished and finished steel products in 2013 compared with 4.0 Mt in 2012 (World Steel Association, 2014, p. 27.

In 2012, the State Company for Iron and Steel (SCIS) signed a final agreement with UB Holding Ltd. of Turkey under which UB Holding would invest $700 million during 18 years to rebuild the SCIS steel complex at Khawr az Zubayr in Al Basrah Governorate. The project, which would be implemented in three phases and completed in 2016, was expected to produce 1.3 million metric tons per year (Mt/yr) of iron and steel products. The SCIS complex was damaged during the war in 2003 and had remained idle since (Iron and Steel State Co., 2013).

Mass Iraq Iron and Steel Industry Co. (a subsidiary of Mass Group Holding Ltd. of Jordan) moved forward with building a new 1.25-Mt/yr steel plant in As Sulaymaniyah in northern Iraq at an estimated cost of $1.25 billion. The plant would include a 120-t-capacity electric arc furnace (EAF), a ladle furnace, and a five-strand continuous caster supplied by the Danieli Group of Italy. The plant was being built in three phases; phase 1 would include construction of a plant that would have the capacity to produce 600,000 metric tons per year (t/yr) of steel reinforcing bar (rebar) from direct-reduced iron (DRI) and scrap. Phase 2 would add production of another 650,000 t/yr of rebar by the end of 2015, and phase 3 was expected to double production of rebar to 2.5 Mt/yr when completed by the end of 2015 (Mass Group Holding Ltd., 2014).

As of yearend 2013, no information was found concerning progress or followup on the previously announced joint venture between ArcelorMittal of Luxembourg and Dayen Co. of Turkey to build a steel minimill with an EAF. The project, which was announced in 2010, had been scheduled to start production in 2011, but production was delayed until 2013, and the site of the plant was moved to Erbil from As Sulaymaniyah. Similarly, no followup reports were found on the progress of Jindal SAW Ltd. of India's plan to build and operate a plant to produce gas and oil pipes in southern Iraq or the plans by CVS Rolling Mill (a subsidiary of CVS Technologies) of Turkey to install machinery for a new 500,000-t/yr-capacity EAF melt shop and a 420,000-t/yr-capacity rebar mill (Steel Guru, 2012; Steel Orbis, 2012).

Industrial Minerals

Bentonite.—Beijing Trading and Development Co. of China built a bentonite-activation plant at Fallujah in Al Anbar Governorate. The plant converts calcium-based bentonite into sodium-based bentonite for use as a drilling mud for oil and gas wells. The plant was expected to tap into Iraq's 22 Mt of bentonite reserves, which are calcium-based and are located in the Traifawi area in the Western Desert. The plant would have an initial capacity of 75,000 t/yr of sodium-activated bentonite (which could be increased to 100,000 t/yr) and was expected to be completed in 2013. As of yearend 2013, there were no confirmations or updates on the completion or the commissioning of the plant (Iraq Geological Survey, 2012).

Cement.—Consumption of cement has been increasing at an annual rate of 15% in recent years. It was projected that the country's consumption of cement would be 35 Mt/yr, whereas its production capacity would be 22 Mt/yr by the end of 2014. The tonnage of Iraq's cement imports also had been increasing steadily in recent years owing to the massive construction activity in the country's commercial, industrial, and residential sectors. Iraq became the leading importer of cement in the Middle East by importing about 12 Mt/yr of cement, or 65% of the country's total consumption. Cement imports came mainly from Iran, Turkey, and Saudi Arabia (Annous, 2012, p. 22; Global Cement, 2013e).

In 2013, Lafarge (Iraq's leading producer of cement) had 5.8 Mt/yr of cement production capacity in Iraq, which accounted for 24% of the country's capacity. Lafarge operated three plants at Bazian and Tasluja in As Sulaymaniyah Governorate in northern Iraq and at Karbala in southern Iraq, respectively. Lafarge and Faruk Group Holding were joint owners of Bazian Cement Co. and Union Cement Co., which operated the Bazian and the Tasluja cement plants, respectively. Karbala Cement Manufacturing Co. (KCMC), which was a joint venture of Lafarge (51%) and Merchant Bridge Co. of the United Arab Emirates (49%), was responsible for the rehabilitation of the Karbala cement plant, which is located in Karbala Governorate in southern Iraq. The plant's capacity was increased to 1.8 Mt/yr of cement from 576,000 t/yr (Annous, 2012; O'Sullivan, 2012; Lafarge S.A., 2014, p. 34).

In April 2013, Lucky Cement Co. of Pakistan said that it was building a greenfield cement grinding facility in Basrah, Iraq. The grinding plant would be a 50–50 joint venture with the Al Shawy family and would have the capacity to produce 0.8 Mt/yr of cement. The plant was expected to start production in April 2014. Lucky also planned to build an integrated cement plant in Basrah with the capacity to produce 1.25 Mt/yr of cement (Global Cement, 2014).

In 2012, Sinoma International Engineering Co. Ltd. of China signed a contract with the Faruk Group to build a greenfield cement plant in As Sulaymaniyah city in northern Iraq. The $180 million plant would have the capacity to produce 1.8 Mt/yr of cement. In August, Sinoma signed an agreement with Gebr Pfiffer S.E. of Germany to supply of five clinker grinding plants for installation in northern Iraq (Global Cement, 2013f, g).

In August, ASEC Cement of Egypt and Qemmet El-Iraq were awarded a 14-year contract by the MIM to manage and renovate the Muthanna cement plant, which is located in the Muthanna Governorate in southern Iraq. The plant had 2 Mt/yr of cement production capacity when it was built in the 1990s, but the current capacity has decreased to 400,000 t/yr because the plant was not maintained during the 1990s when Iraq was under economic sanctions. The joint venture expected to start the restoration of the plant's original capacity of 2 Mt/yr in 2014 and to complete the plant's renovation by August 2016. In May, The Islamic Republic News Agency of Iraq reported that Iran

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planned to install a new cement plant in Iraq. The plant would cost $425 million and have the capacity to produce 2 Mt/yr of cement; it would begin production in 2015 (Global Cement, 2013a, b).

In July, the Government banned cement imports from Iran. The reason for the ban was attributed to protection of domestic cement producers. Cement imports, however, resumed shortly after the ban was announced. Iraq had been importing between 7 Mt/yr and 11 Mt/yr of cement from Iran. In September, the Government banned imports of white cement, but there were no indications as to the effects of the decision on local markets or whether the ban was upheld or lifted (Global Cement 2013c, d).

Nitrogen.—In 2013, three companies had the capacity to produce ammonia and urea in Iraq—State Enterprise for Fertilizer and Petrochemical (South), State Company for Fertilizers Northern Area, and 1st Global Company for Chemical Fertilizers Production Ltd. Production by these companies remained well below capacity because of old equipment at the two state-owned companies and insufficient natural gas allocation. The MIM called for investing in three new urea plants in the Governorates of Al Anbar, Al Basrah, and Ninawa, respectively. The proposed capacity at each of the new plants was between 500,000 t/yr and 1 Mt/yr of urea, and the cost to construct each plant would be between $800 million and $900 million. Natural gas needed as a feedstock for these plants would be available in all locations (Arab Fertilizer Association, 2014, p. 21, 25; State Company for Fertilizers, 2014).

Phosphate Rock.—Al Anbar Council, which is the ruling body of the Al Anbar Governorate, planned to develop its vast phosphate rock deposit in Akashat by building a phosphate rock concentration facility. The Federal Government in Baghdad, however, refused to approve the plan and referred it to the Ministry of Oil. The Al Anbar Council then sued the Federal Government for blocking the development of the phosphate plant. The State Company for Phosphate's phosphate rock production remained well below its production capacity of 3.4 Mt/yr. Most of Iraq's phosphate rock deposits occur in the Paleocene Akashat Formation in Iraq's Western Desert. The deposits are located about 15 to 20 kilometers (km) northeast of the Akashat Mine and cover an area of 40 square kilometers (km^2). Geosurv-Iraq estimated Iraq's phosphate reserves and resources to be 9.53 Gt. The Akashat deposit was estimated to hold 430 Mt of proved phosphate rock reserves grading 21.52% P_2O_5. There were also indicated resources at the Swab deposit, which held an estimated 3.50 Gt of phosphate rock grading 21.71% phosphorus pentoxide (P_2O_5), followed by the Dawima site, 2.76 Gt grading 20.56% P_2O_5; the Marbat deposit, 2.11 Gt grading 21.17% P_2O_5; the Ethna site, 430 Mt grading 17.50% P_2O_5; the H3 site, 313 Mt grading 17.50% P_2O_5; and the Hirri site, 193 Mt grading 21.94% P_2O_5 (Al-Bassam and others, 2012, p. 18; Iraq Business News, 2012; State Company for Phosphate, 2014).

Sulfur.—Mishraq Sulphur State Co. (MSSC) was a state-owned company established to mine sulfur from the Mishraq underground sulfur deposit in the Qaiyarah area, which is located 45 km southeast of the city of Mosul, Ninawa Governorate. Sulfur was produced using the Frasch process, which melts native sulfur by injecting into it streams of hot water and extracting the melted sulfur with air pressure pumps. The company produced alum (hydrated potassium aluminum sulfate), pure sulfur, sulfur fertilizer, and sulfuric acid. In 2013, MSSC began renovating the Mishraq sulfur mine to increase the production capacity to 500,000 t/yr of sulfur. MSSC contracted Devco Corp. of the United States to supply submerged combustion technology equipment. Financing of the project was supported by a loan guarantee from the Export-Import Bank of the United States (Devco Corp., 2014).

Mineral Fuels

Natural Gas.—Production of gross natural gas in Iraq increased by 4.4% to 21.4 billion cubic meters in 2013 compared with that of 2012; of this total, dry gas output was 1.18 billion cubic meters, which was an increase of 83% from that of 2012, according to OPEC statistics (table 1; Organization of the Petroleum Exporting Countries, 2014, p. 33). In May, South Gas Co., which was a 25-year joint venture of South Gas Co. (51%), Royal Dutch Shell (44%), and Mitsubishi Corp. of Japan (5%) formed to capture flared gas from a 19,000-km^2 area in Al Basrah Governorate, started operations at the Basrah Gas project, which is also known as the South Gas Project. The project was expected to be the largest gas project in Iraq's history and the world's largest flares reduction project, according to Royal Dutch Shell. The project area included the Rumaila, the West Qurna 1, and the Zubair oilfields. Natural gas would be captured, treated, and processed for use locally or exported as liquefied natural gas. Natural gas production from the project was expected to increase from about 11 million cubic meters per day (reported as 400 million cubic feet per day) to about 57 million cubic meters per day (reported as 2 billion cubic feet per day) by 2017 (Mirza, 2013; Royal Dutch Shell plc, 2014).

In the Kurdistan region of Iraq, natural gas production by Pearl Petroleum Co. Ltd. (PPCL) from the Chemchemal and the Khor Mor fields averaged more than 10.8 million cubic meters per year. PPCL was a joint venture of Dana Gas PJSC (40%) and Crescent Petroleum (40%), both of the United Arab Emirates, and MOL Hungarian Oil and Gas Co. p.l.c. (MOL) (10%) and OMV Aktiengesellschaft (10%). The project supplied two gas-fired power stations at Chemchemal and Erbil and planned to transport surplus gas to Europe through the Nabucco gas pipeline, which was to be built in the near future. Dana Gas had been producing liquefied petroleum gas (LPG) through two LPG trains at the Khor Mor gas processing plant since 2011. The company had been supplying LPG and condensates by way of a 180-km pipeline to powerplants at Chemchemal and Erbil from the Khor Mor field. In 2013, PPCL continued natural gas and LPG production from the Khor Mor field and moved forward with evaluating the Chemchemal and the Khor Mor reservoirs to increase its production capacity for local needs and for export (Dana Gas P.J.S.C., 2014).

OMV began a drilling program at the Bina Bawi 3 (BB3) exploration well in January and encountered several hydrocarbon-bearing layers. The company planned to drill an exploration well in the Mala Omar Block, make progress in the appraisal of the Bina Bawi Block, conduct tests at the Rovi and the Sarta Blocks, and evaluate test results at the BB3 well (OMV Aktiengesellschaft, 2014, p. 10, 38).

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The Governments of Iran and Iraq agreed to build a natural gas pipeline that would transport natural gas from Iran to Iraq; the pipeline was expected to be completed by March 2014. In the initial phase, 7 million cubic meters per day of natural gas could be delivered to Iraq, and in the final phase, up to 40 million cubic meters per day could be delivered. The pipeline would be 100 km in length and 1.2 meters in diameter and would run from Charmaleh in Kermanshah Province in Iran, to the town of Naft Shahr on the border with Iraq (Tehran Times, 2014).

Petroleum.—In 2013, Iraq was OPEC's third-ranked producer of petroleum after Saudi Arabia and Iran. The number of active rigs in the country decreased to 83 in 2013 from 92 in 2012. The number of crude-oil-producing wells in Iraq increased to 1,735 in 2013 from 1,700 wells in 2012, and the number of completed wells increased to 313 in 2013 from 228 wells in 2012 (Organization of the Petroleum Exporting Countries, 2014, p. 25–27).

Estimates for Iraq's crude-oil-refining capacity in 2013 increased to 830,000 barrels per day (bbl/d) from 820,000 bbl/d in 2012. The output of petroleum products increased by 3.6% to 601,000 bbl/d in 2013 from 580,000 bbl/d in 2012. The Federal Government planned to increase the country's refining capacity to more than 1.5 Mbbl/d by 2017 by building four new refineries at Karbala (140,000 bbl/d), Kirkuk (150,000 bbl/d), Maysan (150,000 bbl/d), and Nasiriyah (300,000 bbl/d) as well as by expanding the capacities at the Basrah and the Daura refineries. Construction on the long-planned Karbala refinery in southern Iraq was expected to take place in early 2014. The $6 billion project was being built by a consortium, led by Hyundai Engineering and Construction, that included GS Engineering and Construction and SK Engineering and Construction (all of the Republic of Korea) (U.S. Energy Information Administration, 2013; BP p.l.c., 2014, p. 16; Oil and Gas Journal, 2014; Organization of the Petroleum Exporting Countries, 2014, p. 25–27, 36, 41).

In 2013, DNO continued with its exploration and drilling of areas covered by the Tawke production-sharing contract (PSC) and the Dohuk PSC in the Kurdistan region in northern Iraq. Production from the Tawke oilfield reached 75,000 bbl/d, and the company estimated that the crude oil and natural gas reserves of the Tawke field exceeded 500 million barrels. DNO, which was the first company to discover crude oil in the Kurdistan region of Iraq in 2006, began exporting oil from the Tawke field in 2011. DNO had interests in two other licenses in the Kurdistan region of Iraq. In 2013, the company was working on increasing production from the Tawke field, drilling exploration wells in the Dohuk PSC and the Tawke PSC license areas, and preparing a declaration of commerciality for the Benenan-3 well on the Erbil license and the Bastora oilfields discovery (DNO International ASA, 2014).

In July, Afren p.l.c. of the United Kingdom purchased stakes in two Kurdistan operations for $588 million. The deal was expected to generate 75,000 bbl/d of crude oil from the Barda Rash PSC within 5 years. Barda Rash is located 55 km northwest of Erbil and operated by Afren, which held a 60% working interest. The company also acquired a 20% working interest in the Ain Sifni PSC, which is located 70 km northwest of Erbil and operated by Hunt Oil Co. of the United States (Afren p.l.c., 2013).

Outlook

In 2014, disputes between the Federal Government of Iraq and the KRG concerning oil exports and revenue and the control of oilfields in Kirkuk continued to escalate, with international oil companies being threatened with legal action by the Federal Government and the KRG, both of which claimed lost revenue from oil shipments. This situation, coupled with the takeover of the city of Mosul and other areas in the Al Anbar and Ninawa Governorates by the self-proclaimed Islamic State of Iraq and Levant, created uncertainty among international oil companies involved with the country's mineral sector (Watts, 2014). The outlook for the mineral sector depends largely on Iraq's political future and its ability to form a national government capable of protecting the interests of all Iraqi stakeholders. Nevertheless, the amount of activity in the mineral industry in Iraq is expected to increase considerably in the short and medium terms to meet increased demand for mineral commodities needed to restore the country's infrastructure and to develop the country's hydrocarbon sector. Production of such mineral commodities as cement, crude oil, fertilizer, limestone, natural gas, phosphate rock, refined petroleum products, steel, and sulfur are expected to increase in the next few years.

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TABLE 1
IRAQ: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2009	2010	2011	2012	2013
INDUSTRIAL MINERALS						
Bauxite		250	3,350	--	--	--
Bentonite[2]		3,959	6,127	6,472	6,530 r	6,288
Cement, hydraulic[e]	thousand metric tons	7,000	8,000	10,000	10,000	10,000
Clay	do.	2,283	2,283	33,013	33,380	34,000 e
Gypsum[3]	do.	626	728 r	713 r	1,369 r	1,400 e
Iron oxide pigments		300	3,000	--	--	--
Kaolin		1,980	20,060	--	--	--
Limestone:						
For cement	thousand metric tons	2,005	986	4,086	4,648	5,000 e
For construction	do.	NA	NA	585	326	500 e
Nitrogen:						
N content of ammonia	do.	30	126	143	143	146
N content of urea	do.	NA	100	129	129	135
Phosphate rock, gross weight	do.	NA	139	122	250	350
Phosphate fertilizer	do.	NA	331	429	450	193
Salt	do.	113	102	136	143	182
Sand and gravel[2]	do.	10,834	10,139	21,300	23,181	24,000 e
Silica sand[2]		17,514	232	173	1,439	1,500 e
Sulfur[e]	thousand metric tons	20	20	20	20	25
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	16,577	16,885	18,692	20,496	21,390
Dry	do.	1,149	1,303	877	646	1,179
Natural gas plant liquids	thousand 42-gallon barrels	15,000	16,000	16,400	16,400	16,400 e
Petroleum:						
Crude, including condensate	do.	891,330	905,200	1,022,365	1,136,975	1,146,465
Refinery products:						
Liquefied petroleum gas	do.	2,482	3,139	3,285	3,614	3,614
Gasoline	do.	21,937	26,207	27,521	27,886	31,354
Kerosene and jet fuel	do.	17,477	19,892	31,901	16,242	15,184
Distillate fuels	do.	31,208	37,339	47,486	46,574	48,326
Residual fuels	do.	76,979	89,973	79,278	103,076	106,945
Other	do.	16,609	24,945	44,370	14,308 r	13,942
Total	do.	166,692	201,495	233,841	211,700 r	219,365

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. do. Ditto. NA Not available. -- Zero.

[1]Table includes data available through January 31, 2015.

[2]Reported in cubic meters and converted to metric tons.

[3]Reported in cubic meters and converted to metric tons, includes only primary gypsum.

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TABLE 2
IRAQ: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement:				
Portland		Southern Cement State Co. (Government, 100%)	Al Basrah plant, An Najaf Al Ashraf plant, Kufa plant, Muthanna plant, Nora plant, As Samawa plant	7,500,000.
Do.		Iraqi Cement Co. (Government, 100%)	Al Qaim plant, Al Qaim; Kirkuk Kirkuk; Fallujah plant, Fallujah; and Kubaisa plant, Kubaisa	5,200,000.
Do.		Northern Cement State Co. (Government, 100%)	Al Tamin plant, Badoosh I, II, and III plants, Mosul; Hammam Al Aleel I and II plants, Mosul; and Sinjar Mosul	3,740,000.
Do.		Bazian Cement Company (Lafarge S.A., 70%, and Faruk Group Holding, 30%)	Bazian plant at Sarchinar, near Hayasi	2,700,000.
Do.		United Cement Company (Lafarge S.A., 60%, and Faruk Group Holding, 40%)	Tasluja plant, near Sulaymaniyah	2,300,000.
Do.		Karbala Cement Manufacturing Co. (Lafarge S.A., 51%, and Merchant Bridge Co., 49%)	Karbala plant, Karbala Governorate	1,800,000.
White		Iraqi Cement Co. (Government, 100%)	Fallujah white cement plant, Fallujah	300,000.
Gypsum		Al Ahlia Gypsum Industrial Co. Ltd., Al Ameen Gypsum Production Co. Ltd., Al Ma'moon Building Materials Co. Ltd., Al Rashid Gypsum Co. Ltd., and Al Shemal Gypsum Industries Co. Ltd.	Baghdad	1,368,750.
Iron and steel[1]		State Company for Iron and Steel (Government, 100%)	Khawr az Zubayr, Al Basrah Governorate	NA.
Natural gas	million cubic meters	Pearl Petroleum Co. Ltd. (PPCL) (Crescent Petroleum, 40%, Dana Gas PJSC, 40%, MOL Hungarian Oil and Gas Co. p.l.c. (MOL), 10%, OMV Aktiengesellschaft, 10%)	Chemchemal and Khor Mor fields, Kurdistan-Iraq	350.
Nitrogen	thousand metric tons	State Enterprise for Fertilizer and Petrochemical (South) (Government, 100%)	Ammonia plant at Abu Al-khasib	230 ammonia; 350 urea.
Do.	do.	State Company for Fertilizers Northern Area (Government, 100%)	Plant at Bayji, Salaheddin	231 ammonia; 202 urea.
Do.	do.	1st Global Company for Chemical Fertilizers Production Ltd. (private, 100%)	do.	369 ammonia; 400 urea.
Petroleum:				
Crude	thousand 42-gallon barrels per day	BP p.l.c., 38%; China National Petroleum Corp. (CNPC), 37%; South Oil Co., 25%	Rumaila, Al Basrah Governorate	1,350.
Do.	do.	China National Petroleum Corp. (CNPC), 75%, and North Oil Co., 25%	Al-Ahdab, Wasit Governorate	140.
Do.	do.	China National Petroleum Corp. (CNPC), 37.5%; South Oil Co., 25%; Petronas Carigali International Sdn Bhd, 18.75%; Total S.A., 18.75%	Halfaya, Maysan Governorate	70.
Do.	do.	CNOOC Ltd., 63.75%; Iraq Drilling Co., 25%, and Türkiye Petrolleri Anonim Ortaklığı (TPAO), 11.25%	Maysan, Maysan Governorate	450.
Do.	do.	DNO International ASA, 55%; Genel Enerji A.S., 25%; Kurdistan National Oil Co., 20%	Tawke, Kurdistan region	100.
Do.	do.	Exxon Mobil Corp., 60%; Royal Dutch Shell plc, 15%; Oil Exploration Co., 25%	West Qurna 1, Al Basrah Governorate	400.

See footnotes at end of table.

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TABLE 2—Continued
IRAQ: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum—Continued:				
Crude—Continued	thousand 42-gallon barrels per day	Eni S.p.A., 32.81%; Missan Oil Co., 25%; Occidental Petroleum Corp., 23.44%; Korean Gas Corp. (Kogas), 17.75%	Zubair, Al Basrah Governorate	270.
Do.	do.	Gazprom OAO, 30%; Oil Exploration Co., 25%; Korean Gas Corp. (Kogas) 22.5%; Türkiye Petrolleri Anonim Ortaklığı (TPAO), 7.5%	Badra, Wasit Governorate	170.
Do.	do.	Lukoil Oil Co., 56.25%; South Oil Co., 25%; Statoil ASA, 18.75%	West Qurna 2, Al Basrah Governorate	NA.
Do.	do.	North Oil Co. (Government, 100%)	Kirkuk, Kirkuk Governorate	280.
	do.	Petronas Carigali International Sdn Bhd, 45%; Japex Garraf Ltd., 30%; North Oil Co., 25%	Garraff, Dhi Qar Governorate	35.
Do.	do.	Royal Dutch Shell plc, 45%; Petronas Carigali International Sdn Bhd, 30%; Missan Oil Co., 25%	Majnoon, Al Basrah Governorate	18.
Do.	do.	Sociedade Nacional de Petróleos de Angola (Sonagol), 75%, and South Oil Co., 25%	Qaiyarah, Ninawa Governorate	120.
Do.	do.	do.	Najmah, Ninawa Governorate	110.
Do.	do.	Taq Taq Operating Co. Ltd. (Genel Enerji A.S., 55%, and Addax Petroleum Corp., 45%)	Taq Taq, Kurdistan region	105.
Refinery products	42-gallon barrels per day	Midland Refineries Co. (Government, 100%)	Daura refinery at Daura	140,000.
Do.	do.	do.	An Najaf Governorate	30,000.
Do.	do.	do.	Samawah	30,000.
Do.	do.	do.	Diwanya	20,000.
Do.	do.	North Refineries Co. (Government, 100%)	Baiji	230,000.
Do.	do.	do.	Kirkuk	30,000.
Do.	do.	do.	Haditha	16,000.
Do.	do.	do.	Qaiyarah	16,000.
Do.	do.	do.	Kasak	10,000.
Do.	do.	South Refineries Co. (Government, 100%)	Al Basrah Governorate	135,000.
Do.	do.	do.	Nasiriyah-Samawah	30,000.
Do.	do.	do.	Missan	20,000.
Do.	do.	Kar Oil & Gas Co. (private, 100%)	Kalak, Erbil	80,000.
Do.	do.	Bazian refinery (Qaiwan Group, 100%)	As Sulaymaniyah	20,000.
Phosphate rock		General Company for Phosphate (Government, 100%)	Mines at Akashat, Al Anbar Governorate	3,400,000.
Phosphatic fertilizer[2, 3]		do.	Plant at Al-Qaim	600,000 TSP; 280,000 MAP; 650,000 NPK.
Phosphoric acid[1]		do.	do.	400,000.
Sulfur		Mishraq Sulphur State Co. (MSSC) (Government, 100%)	Qaiyarah	820,000.
Sulfuric acid[1]		do.	do.	500.000.
Do.		General Company for Phosphate (Government, 100%)	Phosphatic fertilizer plant at Al-Qaim	1,500,000.

Do., do. Ditto. NA Not available.
[1]No production has been reported since 2003.
[2]The fertilizer production unit U400 produced triple superphosphate (TSP), monoammonium phosphate (MAP), and compound fertilizer (NPK).
[3]Fluoride salts production unit U500, which had the capacity to produce 11,000 metric tons per year of aluminum fluoride, was idle for technical problems but was being used to produce unknown quantities of ammonium chloride, pure silica, silica gel, sodium fluorosilicate, sodium phosphate, and zeolites.

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The Mineral Industry of Israel

By Thomas R. Yager

In 2013, Israel played a significant role in the world's production of bromine, magnesium metal, phosphate rock, and potash. The country's share of the world's estimated bromine production amounted to 32%; potash, 6%; magnesium metal, 3%; and phosphate rock, 2%. Israel also accounted for nearly 6% of the world's polished diamond production, by value. Other domestically significant mining and mineral processing operations included the producers of cement, crushed stone, natural gas, and petroleum products. Israel consumed substantial amounts of bromine, phosphate rock, and potash in downstream processing operations; most of the final products of these operations were exported (Bray, 2014; Even-Zohar, 2014; Jasinski, 2014a, b; Ober, 2014).

Minerals in the National Economy

In 2013, the mining and quarrying and the nonmetallic mineral products sectors combined accounted for about 1.3% of the gross domestic product (GDP), and the manufacture of iron, steel, and other metals, about 0.3%. The remainder of the manufacturing sector (which included diamond cutting and polishing, fertilizer production, and petroleum refining) accounted for 15% of the GDP. The chemicals, chemical products, and petroleum products sector employed about 20,000 workers; nonmetallic minerals, about 10,300; mining and quarrying, about 4,200; and diamond cutting and polishing, about 2,600. Israel's total net exports amounted to $56.9 billion in 2013, of which diamond accounted for 16.2%, and manufactured fertilizers, about 3%. Total net imports were valued at about $71.1 billion, of which net mineral fuel imports accounted for 20.5%, and net diamond imports, 11.6% (Central Bureau of Statistics, 2014, p. 624, 690, 772, 781, 794, 824, 905–907; Michael Danon, Senior Coordinator, Health, Safety, and Environment in Quarries and Mines, Ministry of National Infrastructures, Energy and Water Resources, written commun., September 9, 2014).

Production

In 2013, the production of natural gas increased by 106%; crude petroleum, by 70%; triple superphosphate, by 23%; other phosphatic fertilizers, by 18%; common clay, by 17%; sulfuric acid, by 14%; other sand, by 13%; and silica sand, by 11%. Lime production decreased by 61% in 2013; gypsum, by 40%; brick clay, by 16%; magnesium chloride, by 14%; and phosphoric acid, by 13% (table 1; Michael Danon, Senior Coordinator, Health, Safety, and Environment in Quarries and Mines, Ministry of National Infrastructures, Energy and Water Resources, written commun., September 9, 2014).

Structure of the Mineral Industry

Most of Israel's mining and mineral processing operations were privately owned, including the producers of aggregates, bromine, cement, lime, magnesium compounds and metal, natural gas, phosphate rock, potash, and salt. Bromine, cement, lead, magnesium compounds and metal, phosphate rock, potash, potassium nitrate, and sulfuric acid were produced by only one domestic company each. The three leading producers of crushed stone accounted for an estimated 65% of national production in 2013. The diamond cutting and polishing industry was composed of many small producers.

Commodity Review

Metals

Copper.—Altos Hornos de México S.A. de C.V. (AHMSA) planned to reopen the Timna copper mines near Eliat. In 2013, the company was engaged in construction of a new solvent extraction and electrowinning plant with a capacity of 30,000 metric tons per year (t/yr) (Altos Hornos de México S.A. de C.V., 2014, p. 3).

Magnesium.—Dead Sea Magnesium Ltd. (DSM) [a subsidiary of Israel Chemicals Ltd. (ICL)] was a producer of magnesium metal and magnesium alloys. From 2011 through 2013, DSM produced about 27,000 t/yr of magnesium metal. In 2012, the United States imported 13,300 metric tons (t) of magnesium metal and 3,550 t of magnesium alloys from Israel. In 2012, Israel's share of the United States' imports of magnesium metal and magnesium alloys was 82% and 28%, respectively (Bray, 2013).

Industrial Minerals

Bromine.—Brines and carnallite from the Dead Sea were extracted by Dead Sea Bromine Company Ltd. (DSBC) (a subsidiary of ICL) at DSBC's plant at Sdom, which had a capacity of 280,000 t/yr. Bromine production increased to 184,943 t in 2013 from 173,940 t in 2012. DSBC consumed about 70% of its bromine for the manufacture of bromine compounds at its plants in China, Israel, and the Netherlands. Bromine compounds produced by DSBC were used in such applications as flame retardants, natural gas and crude petroleum production, pharmaceuticals, and water treatment (Israel Chemicals Ltd., 2014b, p. 69–70, 73–74, 80).

Diamond.—Israel did not produce rough diamond, but the country was one of the world's leading diamond cutting and trading centers. Domestic diamond cutting and polishing companies specialized in large, high-value gemstones. In 2013, the value of Israel's cut and polished diamond exports increased to $6.2 billion from $5.6 billion in 2012. Of that amount, the

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value of Israel's cut and polished diamond exports produced from domestic cutting and polishing operations decreased to $1.2 billion from $1.3 billion in 2012. The United States received 37% of Israel's polished diamond exports; Hong Kong, 27%; Switzerland, 9%; Belgium, 7%; and India, 2% (Rabinovich and Cohen, 2013; Even-Zohar, 2014; Israel Diamond Institute Group of Companies, 2014).

Israel's cut and polished diamond production declined in recent years because of competition from producers in China and India that had lower labor costs. The domestic diamond cutting and polishing industry also faced problems, including an aging workforce and prices of rough diamond increasing faster than those of polished diamond. In 2013, the industry employed 2,600 workers compared with 2,800 in 2012 and 4,800 in 2003. The Government planned to assist the diamond cutting and polishing industry with recruiting and paying workers, and providing export grants and marketing support (Central Bureau of Statistics, 2004, p. 12.68; 2014, p. 624; Rabinovich and Cohen, 2013).

Magnesium Compounds.—Dead Sea Periclase Ltd. (a subsidiary of ICL) produced about 43,000 t of magnesia from brines in the Dead Sea in 2013; the facility's capacity was 53,000 t/yr. ICL also produced magnesium chloride for use in deicing; output decreased to 91,040 t in 2013 from 105,610 t in 2012 (Israel Chemicals Ltd., 2014b, p. 73, 80; Michael Danon, Senior Coordinator, Health, Safety, and Environment in Quarries and Mines, Ministry of National Infrastructures, Energy and Water Resources, written commun., September 9, 2014).

Phosphate Rock.—Rotem Amfert Negev Ltd. (a subsidiary of ICL) produced phosphate rock at the Arad, the Oron, and the Zin Mines in the Negev Desert. The production of beneficiated phosphate rock increased to 3.58 million metric tons (Mt) in 2013 from 3.51 Mt in 2012. Total national production of phosphate fertilizers increased to 1.02 Mt in 2013 from about 855,000 t in 2012 (Israel Chemicals Ltd., 2014a, p. 11; Michael Danon, Senior Coordinator, Health, Safety, and Environment in Quarries and Mines, Ministry of National Infrastructures, Energy and Water Resources, written commun., September 9, 2014).

Potash.—Dead Sea Works (DSW) (a subsidiary of ICL) used carnallite from the Dead Sea as raw material for its potash plants. The company planned to increase capacity in increments by removing bottlenecks and improving technology at existing plants. By the end of 2014, the total planned increase in capacity was expected to be between 300,000 and 500,000 t/yr. DSW's potash production increased by 1.8% in 2013 (Israel Chemicals Ltd., 2014b, p. 54; Michael Danon, Senior Coordinator, Health, Safety, and Environment in Quarries and Mines, Ministry of National Infrastructures, Energy and Water Resources, written commun., September 9, 2014).

Global consumption (excluding China) of potassium nitrate for agricultural use amounted to about 1 Mt in 2013; Haifa Chemicals Ltd.'s production decreased to 374,000 t in 2013 from 403,500 t in 2012. Most of Haifa's production was in Israel; the company used 0.8 t of potash for every metric ton of potassium nitrate produced. Haifa also produced potassium nitrate for industrial applications (Gabison, 2009; Sociedad Quimica y Minera de Chile S.A., 2014, p. 40, 43; Michael Danon, Senior Coordinator, Health, Safety, and Environment in Quarries and Mines, Ministry of National Infrastructures, Energy and Water Resources, written commun., September 9, 2014).

Mineral Fuels

Coal and Natural Gas.—The joint venture of Noble Energy Inc. of the United States and Delek Energy Group produced natural gas at the Mari-B offshore gasfield in the Mediterranean Sea. In 2013, Noble and Delek's production of dry natural gas increased to about 2.16 billion cubic meters from 1.05 billion cubic meters in 2012, of which the Tamar gasfield produced 1.58 billion cubic meters. Tamar started operations in 2013. Output from Mari-B and other fields decreased to 579 million cubic meters in 2013 from 1.05 billion cubic meters in 2012 as they approached the end of their life. At the end of 2013, reserves at Tamar and Tamar Southwest were estimated to be about 58 billion cubic meters and 12 billion cubic meters, respectively. Gross recoverable reserves at the Leviathan gasfield were estimated to be about 510 billion cubic meters in early 2013 (Petroleum Economist, 2013; Noble Energy, Inc., 2014, p. 3, 13, 16, 18).

Noble and Delek approved an expansion of Tamar's capacity in 2013. The originally planned capacity at Tamar was 10.2 billion cubic meters per year; capacity was likely to increase to nearly 12.4 billion cubic meters per year by the second half of 2015 and to 15.5 billion cubic meters per year in 2016. Noble and Delek also could start production at Leviathan as early as 2017; capacity was expected to be 16.5 billion cubic meters per year. Natural gas from Leviathan could supply a new power station in the West Bank that would be built by Palestine Power Generation Co. (Noble Energy, Inc., 2013, p. 15–16; 2014, p. 13).

In 2012, the state-owned utility Israel Electric Corporation Ltd. (IEC) consumed 1.85 billion cubic meters of natural gas in power generation. The company nearly tripled its consumption in 2013. The increase was mostly attributable to the startup of production at the Tamar gasfield. IEC decreased its consumption of imported coal to 11.8 Mt in 2013 from 14 Mt in 2012 (Israel Electric Corporation Ltd., 2014, p. 61, 63–65, 68).

Adira Energy Ltd. of Canada planned to drill its first well in the Gabriella and Yam Hadera offshore prospects by the end of August 2014. The company relinquished the Samuel prospect in 2013 (Adira Energy Ltd., 2013).

Petroleum.—At the end of 2013, Oil Refineries Ltd. and Paz Oil Company Ltd. had petroleum refineries with capacities of 197,000 barrels per day (bbl/d) and 110,000 bbl/d, respectively. Both companies increased their production in 2013.

In 2013, IEC's consumption of diesel fuel amounted to about 6,300 bbl/d compared with 39,800 bbl/d in 2012. Natural gas consumption increased as diesel consumption decreased (Israel Electric Corporation Ltd., 2014, p. 65).

Outlook

The production of potash is likely to increase from 2014 to 2016 because of ICL's expansion. Natural gas production is

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expected to increase from 2013 to 2019 with the opening of the Leviathan gasfield and the expansion of the Tamar gasfield. Refined copper production could also start in the near future. The production trends for the cement, crushed stone, and sand industries will depend on the strength of the domestic economy. The outlook for bromine, diamond, and phosphate rock and fertilizers will depend on market conditions in the world economy.

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TABLE 1
ISRAEL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
METALS						
Iron and steel, steel, crude[e]		380,000	430,000	500,000 [r]	500,000 [r]	500,000
Lead, refined secondary		26,000	27,000	27,000	21,791 [r]	22,418
Magnesium metal		19,405	23,309	26,284	27,292	27,399
INDUSTRIAL MINERALS						
Bromine, elemental		127,689	184,696	202,313	173,940	184,943
Cement, hydraulic	thousand metric tons	4,759	5,139	5,480	5,892 [r]	6,398
Clays:						
Brick clay[3]		53,581	58,896	57,908	49,539 [r]	41,534
Common clay		578,000	677,900	1,220,379	1,057,000 [r]	1,241,000
Flint clay		NA	NA	300,000	280,000 [e]	280,000 [e]
Diamond[4, e]	thousand carats	299 [5]	245 [5]	230	200	200
Gypsum		9,152	99,730	20,437	45,407	27,200
Lime		428,552	657,897	715,487	769,611 [r]	300,391
Magnesium compounds:						
Magnesia		NA	NA	40,000	42,000	43,000
Magnesium chloride		132,636	135,930	126,988	105,610	91,040
Phosphate:						
Phosphate rock, mine output:						
Beneficiated	thousand metric tons	2,697	3,135	3,105	3,514 [r]	3,578 [3]
P_2O_5 content[e]	do.	1,700 [r]	1,800 [r]	1,900 [r]	1,600 [r]	1,600
Phosphatic fertilizers:						
Monoammonium phosphate		NA	NA	NA	86,600	85,980
Triple superphosphate		NA	NA	NA	455,000	560,940
Other		NA	NA	NA	315,580	371,610
Complex		NA [r]	NA [r]	NA [r]	NA [r]	NA
Phosphoric acid		NA	NA	NA	572,580	500,200
Potassium:						
Potash:						
Gross weight	thousand metric tons	3,112	3,402	2,983	3,528	3,591
K_2O equivalent	do.	1,870 [r]	2,040 [r]	1,790 [r]	2,116 [r]	2,155
Potassium nitrate		NA	NA	NA	403,500	374,000
Salt, marketed	thousand metric tons	357	421	410	415	442
Sand:						
Silica sand		163,206	197,699	232,909	180,000 [r, e]	200,000 [e]
Other[e]	thousand metric tons	5,000	4,000	3,500	4,000 [r]	4,500
Stone:[e]						
Crushed	do.	45,000	45,000	49,000	46,000 [r]	47,000
Dimension, marble		68,000	72,000	72,000	66,000	66,000
Sulfur:[e]						
Byproduct from petroleum[e]	thousand metric tons	50 [5]	55	60	60	60
Sulfuric acid:						
Gross weight	do.	1,600	1,930	1,900 [r]	1,773 [r, 3]	2,030 [3]
S content	do.	520	630	620 [r]	580 [r, 3]	664 [3]
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	2,825	3,234	4,318	2,557 [r]	6,496
Dry	do.	1,178	1,344	1,788	1,047 [r]	2,160
Petroleum:						
Oil shale[6]	thousand 42-gallon barrels	228	221	213	217 [r]	220 [e]
Crude	do.	15	12	34	225 [r]	383

See footnotes at end of table.

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TABLE 1—Continued
ISRAEL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum—Continued:						
Refinery products:						
Liquefied petroleum gas	do.	6,009	6,554	6,600	5,777 r	6,200 e
Gasoline	do.	25,454	23,261	23,048	23,961 r	26,000 e
Naphtha	do.	3,025	3,609	5,713	3,978 r	4,300 e
Kerosene	do.	9,652	10,595	10,521	9,070 r	9,800 e
Distillate fuel oil	do.	28,258	28,162	26,573	29,206 r	31,000 e
Residual fuel oil	do.	16,224	16,790	16,523	12,075 r	13,000 e
Other	do.	9,130 r	11,800 r	12,800 r	12,000 r,e	13,000 e
Total	do.	97,750 r	100,800 r	101,800 r	96,100 r,e	105,000 e

eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. rRevised. do. Ditto. NA Not available.

[1]Table includes data available through November 4, 2014.

[2]In addition to the commodities listed, caustic soda, secondary refined zinc, and semimanufactured steel are produced, but available information is inadequate to make reliable estimates of output.

[3]Includes flint clay from 2008 to 2010.

[4]Imported diamond cut in Israel.

[5]Reported figure.

[6]Converted from metric tons of oil equivalent.

TABLE 2
ISRAEL: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aggregates	Lime & Stone Production Company Ltd. [Housing & Construction Holding Company Ltd., 50%, and Readymix (Israel) Ltd., 50%]	Modiim	6,000 e
Do.	do.	Dragot, Ein Harod, Eliat, Golani Junction, Kadarim, Revivim, Segev, and Shefar'am	5,000 e
Do.	Shapir Civil and Marine Engineering Ltd.	Emek Haela Valley, Iron Village, and Zanuach	10,000 e
Do.	Hanson Israel (subsidiary of HeidelbergCement AG)	Migdal Zedeka and other quarries	8,000 e
Bromine	Dead Sea Bromine Company Ltd. (DSBC) [Israel Chemicals Ltd. (ICL), 100%]	Sdom	280
Cement	Nesher Israel Cement Enterprises Ltd. (Clal Industries and Investments Ltd., 75%)	Plant at Ramle	5,800
Do.	do.	Plants at Haifa and Hartuv	2,000

See footnotes at end of table.

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TABLE 2—Continued
ISRAEL: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Lead, refined, secondary		Hakurnas Lead Works Ltd.	Ashdod	38
Lime		Negev Industrial Minerals Ltd.	Mishor Rotem	180
Do.		Lime & Stone Production Company Ltd.	Shefeya	150
Magnesium:				
Magnesia		Dead Sea Periclase Ltd. [Israel Chemicals Ltd. (ICL), 100%]	do.	53
Magnesium, refined		Dead Sea Magnesium Ltd. (DSM) [Israel Chemicals Ltd. (ICL), 100%]	Sdom	34
Natural gas	million cubic meters	Delek Energy Group, 53%, and Noble Energy Inc., 47%	Tamar gasfield	10,200
Do.	do.	do.	Mari-B gasfield	6,200
Petroleum:				
Crude	thousand 42-gallon barrels	Lapidoth Israel Oil Prospectors Corp.	Heletz-Brur field	8
Do.	do.	do.	Kochav field	3
Refined	do.	Oil Refineries Ltd. (Israel Corp., 45.1%)	Haifa	71,900
Do.	do.	Paz Oil Company Ltd.	Ashdod	40,200
Phosphate:				
Phosphate rock		Rotem Amfert Negev Ltd. [Israel Chemicals Ltd. (ICL), 100%]	Arad, Oron, and Zin Mines in the Negev Desert	4,500
Phosphatic fertilizers		do.	Mishor Rotem	1,900
Do.		Haifa Chemicals Ltd.	Haifa	NA
Phosphoric acid[1]		Rotem Amfert Negev Ltd.	Mishor Rotem	640
Do.		Haifa Chemicals Ltd.	Haifa	NA
Potash		Dead Sea Works (DSW) (Israel Chemicals Ltd. (ICL), 100%]	Sdom	3,200
Salt		do.	do.	700
Do.		Israel Salt Industries Ltd. (subsidiary of Danker Group)	Eliat	150
Do.		do.	Atlit	14
Silica sand		Negev Industrial Minerals Ltd.	Mactesh Htira	300
Steel:				
Crude		Hod Metal Products & Manufacturing Co. Ltd.	Akko	300
Do.		Yehuda Steel Ltd.	Ashdod	180
Billet		do.	Bene Ayish	200
Do.		do.	Ashdod	180
Do.		Hod Metal Products & Manufacturing Co. Ltd.	Akko	300
Rebar		Yehuda Steel Ltd.	Bene Ayish	200
Do.		do.	Ashdod	120
Do.		Hod Metal Products & Manufacturing Co. Ltd.	Kiryat Gat	300
Sulfur		Oil Refineries Ltd.	Ashdod	40
Do.		Paz Oil Company Ltd.	Haifa	33
Sulfuric acid		Rotem Amfert Negev Ltd.	Mishor Rotem	2,400
Zinc		Numinor Chemical Industries Ltd.	Maalot	NA

[e]Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.
[1]P_2O_5 equivalent.

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The Mineral Industry of Jordan

By Mowafa Taib

In 2013, Jordan continued to be a significant supplier of such industrial mineral commodities as bromine, phosphate rock, phosphate fertilizers, and potash to the world. The country was among the world's top ten producers of bromine, phosphate rock, and potash. Jordan also produced modest quantities of calcium carbonate, cement, clay, crude oil, steel, kaolin, limestone, natural gas, pozzolanic materials, refined petroleum products, silica sand, and zeolitic tuff mainly for domestic use (table 1; Jasinski, 2014a, b; Ober, 2014).

Minerals in the National Economy

Jordan's gross domestic product (GDP) increased in real terms by 2.8% in 2013 compared with an increase of 2.7% in 2012. The GDP in nominal value was $33.6 billion in 2013 compared with $31.0 billion in 2012. The mining and quarrying sector, which included bromine, phosphate rock, and potash production, contributed 2.5% to the country's GDP in 2013. The manufacturing sector, which included cement, fertilizer, and iron and steel production, contributed 19.2% to the country's GDP, and the construction sectors contributed 5.0% to the GDP. The mining and quarrying sector activity decreased in value at both constant and current prices in 2013 compared with the previous 2 years. Compared with a growth rate of 19.4% and 17.7% at constant basic prices in 2010 and 2011, respectively, the mining and quarrying sector registered a negative growth of 10.9% and 17.1% in 2013 and 2012, respectively. The decrease was attributable to decreased production volume of both phosphate rock and potash. The growth rate of the industry sector, however, has maintained positive values annually since 2009. The construction sector reversed its negative growth rate, which averaged 3.3% per year at constant prices from 2010 to 2012 and showed an 8.7% increase in 2013. The increase in construction sector activity was attributed to accommodations made for the increased flow of refugees from Syria (Bank Audi, S.A.L., 2014, p. 2; Central Bank of Jordan, 2014, p. 8–9, 85–86; International Monetary Fund, 2014, p. 42).

Government Policies and Programs

Jordan imported about 97% of its fuel to meet the country's increasing demand for energy. A long-term national energy policy had not been formulated until recently as the country previously received some of its crude oil imports in the form of grants from Iraq and other Arab Gulf countries. The increase in crude oil prices and the unreliability of crude oil grants made it necessary for Jordan to have a long-term plan to address its high energy costs. Much emphasis was initially placed on building a nuclear powerplant, but then it was shifted to using the country's abundant oil shale reserves, and more recently, to developing renewable sources of energy, such as solar and wind. The national comprehensive energy strategy called for using oil shale as a fuel to generate electricity or to distill it to produce crude oil. One of the objectives of Jordan's energy strategy was to increase the share of renewable energy usage to meet 7% of the country's primary energy needs by 2015 and 10% by 2020 (Ministry of Energy and Mineral Resources, 2013, p. 21).

Jordan's natural gas imports from Egypt by way of the Arab gas pipeline were severely reduced from 2011 to 2013 because of several attacks on the pipeline in the Sinai Peninsula. Therefore, the Government took immediate steps to offset natural gas shortages from Egypt. These steps included building a new liquefied petroleum gas (LPG) terminal at the Port of Aqaba on the Red Sea; constructing a floating liquefied natural gas (LNG) receiving terminal near the Port of Aqaba that could be connected to the shore by way of a pipeline; building a storage facility for petroleum products near Amman that would have the capacity to store 250,000 to 300,000 metric tons (t) of refined petroleum products; and negotiating a long-term contract with Noble Energy Inc. of the United States to supply natural gas to Arab Potash Co. (APC) and Jordan Bromine Co. (JBC) plants on the east coast of the Dead Sea from Noble's offshore gasfield by way of Israel (Song Loong, 2014, p. 52).

Production

Bromine production was estimated to have increased by one-third in 2013 compared with that of 2012. The increase was attributable to the completion of an expansion project at JBC. Notable decreases in mineral commodity production output in 2013 compared with that of 2012 included the decrease in phosphate rock output (by 15%), aluminum fluoride (11%), potash (4%), crude oil and natural gas (9%), and refined petroleum products (7%) (table 1).

Structure of the Mineral Industry

National Petroleum Co. and Jordan Petroleum Refinery Co. Ltd. were wholly state owned. Arab Company for White Cement, APC, Jordan Abyad Fertilizers and Chemicals Co. P.S.C. (JAFCCO), JBC, Jordan Indian Fertilizer Co. (JIFCO), Jordan Lafarge Cement Factories Co. P.S.C. (JCFC), Jordan Phosphate Mines Co. p.l.c. (JPMC), and Nippon Jordan Fertilizer Co. had joint private and public ownership, whereas other companies were privately owned (table 2).

The Natural Resources Authority (NRA), which is an autonomous Government agency under the Ministry of Energy and Mineral Resources, was responsible for the development and regulation of the country's mineral resources in accordance with mining law No. 12 of 1968. The NRA promotes the country's mineral resources to attract investment in the mineral industry and to increase the mineral sector's contribution to the country's economy. The NRA conducts geochemical and geophysical surveys as well as the national geologic mapping project; issues exploration licenses, export permits, and mining

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rights; and undertakes geologic studies and surveys (Natural Resources Authority, 2014a).

Mineral Trade

In 2013, the value of Jordan's total exports was $7.9 billion, which was nearly unchanged from that of 2012, and the value of imports increased by about 5% to $19.6 billion (of which $5.2 billion was fuel oil and natural gas imports) from about $18.5 billion in 2012 (of which about $5.9 billion was fuel oil and natural gas imports). The destinations of exports included Iraq, 18.4% of total exports; the United States, 17.6%; Saudi Arabia, 13.6%, India, 7.3%; the United Arab Emirates, 4.0%; and Indonesia, 3.4%. Crude materials exports, which included phosphate rock and potash exports, contributed 15.7% of the country's total exports in 2013, and chemical exports, which included fertilizer and bromine salts, contributed 25.9% (Department of Statistics, 2014, p. 232; International Monetary Fund, 2014, p. 24).

Phosphate rock exports decreased in tonnage by 25% in 2013 compared with those of 2012, which was 20% less than that of 2011. The quantity of phosphate rock exports decreased to 3.2 million metric tons (Mt) in 2013 from 4.3 Mt in 2012. More than 71% of those phosphate rock exports went to India, followed by Indonesia, 13.6%; Bulgaria, 4.6%; Japan, 3.9%; and Taiwan, 3.5%. JPMC's fertilizer exports were received by India and Turkey, 28% each; Ethiopia, 17%; Bulgaria, 13%; Iraq, 7%; and the United Arab Emirates, 3% (Jordan Phosphate Mines Co. p.l.c., 2014, p. 36).

In 2013, Jordan's potash sales (including domestic sales) increased by about 12% to 1.77 Mt from 1.64 Mt in 2012. Potash exports were received by India, which accounted for 19.8% of Jordan's total potash exports; Indonesia, 17.6%; Malaysia, 14.3%; China, 14.0%; other African countries, 4.8%; Egypt and European countries, 4.4% each; Arab Gulf countries, 3.4%; and Japan, 2.4% (Arab Potash Co., 2014, p. 36).

In addition to crude oil and refined petroleum products, Jordan imported liquid ammonia and sulfur for use in fertilizer manufacturing as well as iron and steel. In 2013, Jordan imported 868,000 t of finished and semifinished steel products compared with about 1.2 Mt in 2012 and about 1.1 Mt in 2011. Sulfur imports, which were used as feedstock for sulfuric acid, phosphate fertilizers, and phosphoric acid production, amounted to 409,000 t in 2012 compared with 508,500 t in 2011. Imports of liquid ammonia, which were used in diammonium phosphate (DAP) production, decreased to 180,900 t in 2012 compared with 197,300 t in 2011 (Department of Statistics, 2014, p. 138; World Steel Association, 2014, p. 55).

Jordan has a free-trade agreement with the United States, and was the United States 68th-ranked trading partner in 2013. The value of U.S. exports to Jordan increased by 18% to $2.1 billion in 2013 from $1.8 billion in 2012, and the value of imports from Jordan to the United States increased by about 4% to $1.20 billion in 2013 from $1.16 billion in 2012. The top U.S. export categories in 2013 included fuel minerals and other petroleum products, $399 million; excavating machinery, $34 million; aluminum and alumina, $15 million; drilling and oilfield equipment, $9 million; and copper and iron and steel products, $2 million each (Office of the United States Trade Representative, 2014; U.S. Census Bureau, 2014).

Commodity Review

Industrial Minerals

Bromine.—Bromine production data in table 1 were revised to report quantities of elemental bromine rather than quantities of bromine salts and other products. Bromine was produced by JBC, which is located at the Ghur Al Safi area about 17 kilometers (km) from the city of Karak. JBC was a joint venture of Albemarle Holding Co. Ltd., which was a wholly owned subsidiary of Albemarle Corp. of the United States and the APC. The company extracted bromine from waters of the Dead Sea to produce elemental bromine and such bromine compounds calcium bromide, which is used in oilfield drilling; hydrogen bromide gas, which is used as a catalyst and reducing agent; sodium bromide, which is used in photography; and tetrabromobisphenol-A, which is used for flame retardation. The bromine products were marketed by Albemarle Corp. JBC invested $169 million to double the plant's bromine production capacity and increase its capacity to produce bromine salts and other bromine-based products. The expansion work was completed in the second quarter of 2013, and the company's production capacity doubled to 100,000 metric tons per year (t/yr) of bromine from 50,000 t/yr and to 200,000 t/yr of bromine salts from 100,000 t/yr. JBC had 280 employees (table 2; Arab Potash Co., 2014, p. 23).

Cement.—According to the Arab Union for Cement and Building Materials, Jordan's cement production capacity was 10.9 million metric tons per year (Mt/yr) in 2012 (the latest year for which comprehensive information was available). Six companies produced an estimated 5 Mt of cement in Jordan in 2013. They included Al Rajhi Cement–Jordan, Arab Company for White Cement Industry, Jordan Lafarge Cement Factories Co. P.S.C. (JCFC), Modern Cement and Mining Co., Northern Cement Co., and Qatrana Cement Co. The high cost of energy prompted cement producers such as JCFC, which had two cement plants with a combined production capacity of 4.8 Mt/yr and 33% of the domestic market share, to switch to coal instead of fuel oil as a source of energy to reduce operating costs. JCFC was also experimenting with using oil shale as an energy source in its cement plants (table 2; Arab Union for Cement and Building Materials, 2013; Lafarge Group S.A., 2014, p. 57–58).

Magnesium Compounds.—Jordan Magnesia Co. (JORMAG) was a public shareholding company created in 1997 to produce magnesium oxides and magnesium hydroxide. Production at the company, which had eight employees in 2013, has been idle since 2005. JORMAG's losses at the end of 2013 were about $88 million. APC planned to increase its share in JORMAG's capital to 93% from 55% in 2014 (Arab Potash Co., 2014, p. 24).

Phosphate Rock.—In 2013, JPMC, which was the country's only phosphate rock producer, employed 4,056 people compared with 4,234 people in 2012. JPMC produced phosphate rock, phosphate-based fertilizers, and phosphoric and sulfuric acids. JPMC produced 5.4 Mt of phosphate rock in 2013, which was a 29% decrease from the record output of about 7.6 Mt in 2011. The decrease was attributed to external factors, such

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as international market volatility and weak demand for phosphate-based fertilizers and products, especially by India. The decrease in India's phosphate rock imports from Jordan was attributed to the decreased fertilizer subsidy given to farmers by the Indian Government and to the lower exchange rate of India's rupee against the U.S. dollar. Sixty-seven percent of Jordan's phosphate rock output came from the Eshidiya Mine, 20% from the Wadi Al-Abiad Mine, and 13% from the Al-Hassa Mine. The Eshidiya Mine, which produced 3.6 Mt of phosphate rock in 2013, had 1.23 billion metric tons (Gt) of total ore reserves including proved, probable, and possible reserves. The Wadi Al-Abiad Mine, which produced about 1.1 Mt of phosphate rock, had 14.4 Mt of proved reserves, and the Al-Hassa Mine, which produced 724,000 t of phosphate rock, had 22.3 Mt of proved reserves (Jordan Phosphate Mines Co. p.l.c., 2014, p. 8, 12).

Jordan India Fertilizer Co. (JIFCO) completed the construction of a $671 million phosphoric and sulfuric acid complex at Eshidiya in Ma'an Governorate. JIFCO was a joint venture formed by Indian Farmers Fertilizers Cooperative of India (IFFCO) (52% interest) and JPMC (48% interest) to build a phosphoric acid plant, which had the capacity to produce 475,000 t/yr of phosphoric acid and 1.5 Mt/yr of sulfuric acid. JPMC committed to supply JIFCO with 2 Mt/yr of phosphate rock. Most of the phosphoric acid produced was exported to India where it was used as feedstock for IFFCO's Kandla fertilizer plant, which is located in the State of Gujarat (Jordan India Fertilizer Company L.L.C., 2014).

PT Petro-Jordan Abadi Co., which was a 50–50 joint venture of JPMC and Petrokemia Gresik of Indonesia, formed to build a new 200,000-t/yr capacity phosphoric acid plant in Indonesia. JPMC would supply 500,000 t/yr of phosphate rock for the plant, and production was expected to begin in mid-2014 (Jordan Phosphate Mines Co. p.l.c., 2014, p. 19).

Potash.—APC, which was the only producer of potash in Jordan, employed 2,176 people in 2013 and produced fine, granular, industrial, and standard grades of potash. In 2013, APC produced about 1.74 Mt of potash compared with 1.82 Mt in 2012. The volume of potash sales decreased by 4% compared with that of 2012 owing to weak demand in the company's main market (India). APC had several subsidiaries, including Arab Fertilizers and Chemicals Industries Ltd. (Kemapco), which employed 228 people and produced potassium nitrate and dicalcium phosphate; Jordan Dead Sea Industries Co.; Jordan Magnesia Co., which was under liquidation; and Numiera Mixed Salts and Mud Co., which employed 55 workers. APC was also affiliated with JBC; Jordan Industrial Ports Co.; Jordan Safi Salt Co., which was under liquidation in 2009; and Nippon Jordan Fertilizer Co. (Arab Potash Co., 2014, p. 12, 22–23, 31).

Mineral Fuels and Related Materials

Oil Shale.—The Government had been actively promoting foreign investment to develop the country's oil shale resources, which were estimated to be from 90 to 100 billion barrels (Gbbl) of crude oil, and ranked Jordan as the world's fourth largest country in terms of the volume of oil shale resources after the United States, China, and Russia. Oil shale is a solid hydrocarbon rock whereas shale oil or tight oil is a light crude oil confined to such sedimentary formations as limestone, sandstone, or shale. The U.S. Energy Information Administration estimated that the Batra shale, which lies under the Hamad and the Wadi Sirhan basins in eastern Jordan, contains about 1 trillion cubic meters of risked shale gas in-place, including 198 billion cubic meters of risked, technically recoverable gas resources. Shale oil estimates within the Batra shale were 4 Gbbl of risked shale oil in-place containing 100 million barrels of risked, technically recoverable shale oil resources (Tar Sands World, 2013; U.S. Energy Information Administration, 2013, p. XXV–2).

As of yearend 2013, the NRA offered concessions for oil shale exploration and production, through commercial agreements, to Jordan Oil Shale Co. (a subsidiary of Royal Dutch Shell p.l.c. of the United Kingdom), Jordan Oil Shale Energy Co. (a subsidiary of Eesti Energia of Estonia), and Al Karak International Oil Co. The concession held by Jordan Oil Shale comprised several locations and covered 22,270 square kilometers (km^2). The company developed a subsurface model for exploiting oil shale using an in situ conversion process, which would eliminate the need to transport oil shale to processing plants. Jordan Oil Shale Energy's concession, which is located at the Attarat um Ghudran property, covers 42 km^2 in central Jordan and holds 2 Gt of oil shale reserves. The concession area could be increased in the future to include 4 Gt of oil shale reserves. The company was expected to build the first oil-shale-fired powerplant in the region. The plant would have 500 megawatts (MW) of capacity. The project was expected to begin production in 2017. The third concession, which was held by Al Karak International Oil Co., covers 35 km^2 in the Al Lajjun area (Jordan Oil Shale Co., 2014; Natural Resources Authority, 2014b).

The NRA signed a memorandum of understanding with Global Petroleum Corp. of the Republic of Korea to explore for oil shale in the Dead Sea region. The NRA awarded Global Oil Shale Holdings of Canada two oil shale exploration and production contracts in the Attarat Umm Ghudran Block, which is located in central Jordan, and in the Isfir Al Mahatta Block, which is located in the southern part of the country. The 2-year agreement would cover exploration in a 221-km^2 area. In 2013, the NRA called on international oil and gas companies to participate in a bid round for the exploration and exploitation of crude oil and natural gas in the South Jordan Block, which covers an area of 10,416 km^2 under production-sharing agreements (Natural Resources Authority, 2012; Oil and Gas Journal, 2012; Roscoe, 2013).

Renewable Energy.—The Government approved the Renewable Energy and Efficient Energy Law No. 13 of 2012. The law established the legal, legislative, and regulatory framework for investment in renewable energy projects in Jordan and authorized the Ministry of Energy and Mineral Resources to approve proposed renewable energy projects and to grant tariff exemptions on imported renewable energy equipment. In 2013, the Government awarded several contracts to international companies to develop solar and wind energy generation projects. They included a $187 million contract with Korea Electric Power Co. to construct the Al Fujeil wind farm, which would have 90 MW of power generation capacity and would start production by 2015. Other projects included the Quweirah

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photovoltaic solar project and the Ma'an wind farm, which would have from 65 MW to 75 MW of electricity-generating capacity each. Jordan Wind Project Co. (JWPC) was a joint venture of E.P. Global Energy of Cyprus (51% interest) and InfraMed Infrastructure Fund of France (49% interest) formed to develop a wind farm at Tafila, which is located 180 km south of Amman. The International Finance Corp. of the World Bank, agreed to loan up to $75 million to JWPC and to arrange for an additional $141 million to fund the project, which required $302 million to build. Development of the 117-MW-capacity Tafila wind farm was expected to be completed by yearend 2015. The project would be operated as an independent power producer that was expected to sell all its generated electricity to Jordan's electricity network, National Electric Power Co. (Ministry of Energy and Mineral Resources, 2013, p. 11, 14; 2014, p. 11; International Finance Corp., 2014; Zawya, 2014).

Outlook

The Arab Gulf countries allocated a $5 billion projects-specific grant to Jordan to support the country's economy, which was negatively affected by political unrest in Syria and Egypt. Jordan's export capacity of bromine, fertilizer, phosphate rock, and potash is expected to increase in 2014 following the completion of the export hub at Aqaba Port, which was built by APC and JPMC. In February 2014, APC and JBC signed an agreement with Noble Energy to import 2 billion cubic meters of natural gas from the Tamar field, located off the coast of Israel, for a period of 15 years. By the end of the first quarter of 2014, the Government approved 12 power purchase agreements for 12 photovoltaic solar power projects, which would have 200 MW of generating capacity, but in August the Government canceled 4 of the approved renewable energy power projects because of lack of funding (Ministry of Energy and Mineral Resources, 2014, p. 11; Zawya, 2014).

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TABLE 1

JORDAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity		2009	2010	2011	2012	2013[e]
METALS						
Steel:[e]						
Crude		150	150	150	150	150
Semimanufactured		1,630 [r]	960 [r]	850 [r]	850 [r]	850
INDUSTRIAL MINERALS						
Bromine[2]		50 [r]	50 [r]	50 [r]	60 [r]	80
Calcium carbonate		317	411	46	623	620
Cement, hydraulic		3,876	3,043	2,816	4,900 [r]	5,000
Clay:						
Common		765	929	421	1,097	1,100
Dead Sea mud	metric tons	1,348	227	295	300	300
Kaolin		177	115	90	76	80
Fertilizers[3]		726	812	824	640	678 [4]
Fluorine, aluminum fluoride		9	9	11	9	8 [4]
Gypsum		304	292	255	857	860
Lime		8	16	18	18	20
Limestone, pure		2,352	559	187	1,984	2,000
Phosphate:						
Phosphate rock, mine output:						
Gross weight		5,282	6,529	7,594	6,383	5,399 [4]
P_2O_5 content		1,690	2,090	2,430	2,043	1,728 [4]
Diammonium phosphate		648 [r]	753 [r]	710 [r]	601 [r]	606 [4]
Phosphoric acid		488	549	504	448	463 [4]
Potash:						
Crude salts		1,120	2,141	2,259	1,824	1,744 [4]
K_2O equivalent		683	1,185	1,355	1,094	1,046 [4]
Salt:						
Brine		23	33	32 [r]	32	32
Dead Sea[5]	metric tons	191	1,152	1,263	1,270	1,250
Sand:[6]						
Silica		298	150	88	88 [e]	90
Other		4,620	3,930	4,000	4,000 [e]	4,000
Stone:						
Basalt	thousand cubic meters	44	14	15	15 [e]	15
Dimension:						
Worked	thousand meters	6,356	6,356	4,032	8,000	8,000
Marble	thousand cubic meters	46	46 [e]	50	50 [e]	50
Gravel and crushed rock:						
Basalt[e]	cubic meters	1,092 [4]	1,090	1,090	1,090	1,090
Granite	do.	4,102	4,100	--	--	--
Marble	do.	30,809	46,000	45,961	240,000	250,000
Other	do.	14,857	31,000	30,000 [e]	30,000 [e]	30,000
Pozzolanic material		619	104	104 [e]	110	110
Travertine	metric tons	10,885	9,440	5,905	6,000	6,000
Zeolite tuff		12	12 [e]	14	13	13
Sulfuric acid:						
Gross weight		1,370 [r]	1,680 [r]	1,539 [r]	1,419 [r]	1,488 [4]
S content		447 [r]	549 [r]	502 [r]	460 [r]	486 [4]

See footnotes at the end of table.

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TABLE 1—Continued

JORDAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity		2009	2010	2011	2012	2013[e]
MINERAL FUELS AND RELATED MATERIALS						
Natural gas:						
Gross	million cubic meters	221 [r]	229 [r]	181 [r]	164 [r]	150 [4]
Petroleum:						
Crude	thousand 42-gallon barrels	9,397	8,909	7,190	8,790	8,000 [4]
Refinery products:						
Asphalt	do.	1,170	909	648	588	575 [4]
Distillate fuel oil	do.	8,751 [r]	6,736 [r]	7,684 [r]	8,273 [r]	7,448 [4]
Gasoline	do.	6,435 [r]	5,976 [r]	5,788 [r]	6,086 [r]	5,870 [4]
Jet fuel and kerosene	do.	3,073 [r]	3,381 [r]	3,057 [r]	3,579 [r]	2,970 [4]
Liquefied petroleum gas	do.	1,241 [r]	986 [r]	974 [r]	1,183 [r]	1,010 [4]
Residual fuel oil	do.	6,127 [r]	7,193 [r]	5,781 [r]	6,653 [r]	6,649 [4]
Total	do.	26,797 [r]	25,181 [r]	23,932 [r]	26,362 [r]	24,522 [4]

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. -- Zero.

[1]Table includes data available through August 12, 2014.

[2]Revised to report quantities of elemental bromine rather than quantities of bromine salts and other products.

[3]Includes compound fertilizer [nitrogen, phosphorus, and potassium (NPK)], potassium nitrate, and potassium sulfate.

[4]Reported figure.

[5]Extracted from the Dead Sea for therapeutic use; contains bromide, calcium, chloride, magnesium, and potassium salts.

[6]Reported as cubic meters and converted to metric tons.

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TABLE 2
JORDAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum fluoride		Jordan Phosphate Mines Co. p.l.c. (JPMC) (Kamil Holding Ltd., 37.000%; Jordan Finance Ministry, 26.261%; Social Security Corp., 16.030%; Kuwait Investment Corp. 9.333%; Passport Global Master Fund Spc Ltd., 2.775%; Jordan Islamic Bank, 1.465%; private investors, 7.136%)	Aqaba	14,000
Basalt		Jordan Rock Wool Industries Co. Ltd.	Qa'a Hanna	5,000
Bromine		Jordan Bromine Co. (JBC) [Arab Potash Company Ltd. (APC), 50%, and Albemarle Corp., 50%]	Ghur Al Safi	100,000
Cement		Al Rajhi Cement-Jordan (Al Rajhi Cement Holding)	Al-Mafraq	2,000,000
Do.		Arab Company for White Cement Industry [Jordanian Syrian Company for Industry, 50%; General Establishment for Cement (Syria,), 25%; Jordan Finance Ministry, 15%; Social Security Corp., 10%]	Amman	130,000
Do.		Qatrana Cement Co. (Arabian Cement Co., 100%)	Al Qatraneh	1,800,000
Do.		Jordan Lafarge Cement Factories Co. P.S.C. (JCFC) (Lafarge S.A., 50.28%; Social Security Corp., 21.86%; others, 27.87%)	Fuheis and Ar-Rashadiya	4,800,000
Do.		Modern Cement and Mining Co. (Manaseer Group for Industries and Commercial Investments of Jordan, 100%)	do.	1,200,000
Do.		Northern Cement Co.	Mill at Muwaqar	1,000,000
Feldspar		General Mining Co. Ltd.	Al-Jaishiah	10,000
Gypsum		Al-Nasr Mining Establishment	Mujib	31,000
Do.		Al-Nisr/Ali Manaseer	do.	89,000
Do.		Al-Noor Mining Co.	do.	11,000
Do.		Falahat Mining Establishment	do.	25,000
Do.		Isam Alshoouly & Maksim	do.	13,000
Do.		Jordan Lafarge Cement Factories Co. P.S.C.	Zarqa	73,000
Do.		Mansour Al Shoabaki Establishment	Mujib	2,000
Do.		Public Mining Co. Ltd.	do.	68,000
Do.		Shaker Al-Talib Establishment	Subeihi	15,000
Kaolin		Al-Faori Enterprise for Mining	Al-Adasieh	110,000
Do.		Jordanian Company for Mining and Processing of Kaolin and Feldspar	Qanasieh	216,000
Do.		Public Mining Company Ltd.	Fuaheis	38,000
Do.		do.	Batn el-Ghoul	31,000
Lime		Arab Company for White Cement Industry [Jordanian Syrian Company for Industry, 50%; General Establishment for Cement (Syria,), 25%; Jordan Finance Ministry, 15%; Social Security Corp., 10%]	Khalidiah	NA
Natural gas	million cubic meters	National Petroleum Co. (Government, 100%)	Risha	210
Petroleum:				
Crude	thousand 42-gallon barrels	do.	Hamza	8,000
Refined	do.	Jordan Petroleum Refinery Co. Ltd. (Government, 100%)	Zarqa	36,500
Phosphate:				
Phosphate rock		Jordan Phosphate Mines Co. p.l.c. (JPMC) (Kamil Holding Ltd., 37.000%; Jordan Finance Ministry, 26.261%; Social Security Corp., 16.030%; Kuwait Investment Corp. 9.333%; Passport Global Master Fund Spc Ltd., 2.775%; Jordan Islamic Bank, 1.465%; others, 5.065%)	Wadi Al-Abiad, Al-Hassa, Eshidiya, and Russeifa Mines	7,000,000
Phosphatic fertilizers		do.	Aqaba	650,000
Do.		Jordan Abyad Fertilizers and Chemicals Co. P.S.C. (JAFCCO) [Jaffco Bahrain Co., 42.79%; Jordan Phosphate Mines Co. p.l.c. (JMPC), 25%; Venture Capital Bank, 14.4%; Arab Mining Co., 10%; Sea Field Trading, 5%; Al-Fares Investments, 2.81%]	do.	80,000
Do.		Nippon Jordan Fertilizer Co. [Asahi Industries Company Ltd. 10%; Mitsubishi Corp., 10%; Mitsubishi Chemicals Corp., 10%; Zen-Noh, 30%; Arab Potash Co. Ltd. (APC), 20%; Jordan Phosphate Mines Co. p.l.c. (JPMC), 20%]	Eshidiya	300,000

See footnotes at end of table.

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TABLE 2—Continued
JORDAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Phosphate—Continued:			
Phosphoric acid	Jordan Phosphate Mines Co. p.l.c. (JPMC)	Aqaba	350,000
Do.	Jordan India Fertilizer Co. (JIFCO) [Indian Farmers Fertilizers Cooperative of India (IFFCO), 52%, and Jordan Phosphate Mines Co. p.l.c. (JPMC), 48%]	Eshidiya	475,000
Do.	Indo-Jordan Chemicals Co. Ltd. (Jordan Phosphate Mines Co. p.l.c. (JPMC), 87%, and Arab Investment Co., 13%)	do.	200,000
Potash	Arab Potash Co. Ltd. (APC) (Potash Corporation of Saskatchewan Inc., 27.96%; Arab Mining Co., 19.92%; Islamic Development Bank, 5.16%; Social Security Corp., 5.04%; Iraqi Government, 4.71%; Libyan Arab Company for Foreign Investments, 4.06%; Kuwait Investment Authority, 3.95%; other investors, 2.32%)	Ghur Al Safi	2,450,000
Potassium nitrate	Arab Fertilizers and Chemicals Industries Ltd. (Kemapco) [Arab Potash Co. Ltd. (APC), 100%]	Aqaba	150,000
Potassium sulfate	Jordan Abyad Fertilizers and Chemicals Co. P.S.C. (JAFCCO) [Venture Capital Bank, 57.2%; Al-Fares Investments, 17.8%; Jordan Phosphate Mines Co. p.l.c. (JMPC), 15%; Arab Mining Co., 10%]	do.	80,000
Pozzolanic material	Jordan Lafarge Cement Factories Co. P.S.C.	Tel Remah	350,000
Do.	do.	Ar-Rashadiya	150,000
Salt	Arab Potash Co. Ltd. (APC), 100%	Ghur Al Safi	17,000
Sand, silica	Middle East Regional Development Enterprises	Ras en Naqab	530,000
Do.	Al-Habahbeh and Sons Company for Mining	do.	28,000
Do.	Al-Rehab for Industrial and Trading Establishment	do.	27,000
Do.	Al-Fares Company for Glass Sand Mining	do.	17,000
Do.	International Silica Industries	Dabbet Hanot/ Ras En Naqab	NA
Do.	Green Technology Group of Jordan for Mining	Al-Homaimeh	NA
Steel:			
Crude	Jordan Steel Co. p.l.c.	Amman	360,000
Semimanufactured	do.	do.	300,000
Do.	National Steel Industry Co.	Awajan	100,000
Sulfuric acid	Jordan Abyad Fertilizers and Chemicals Co. P.S.C. (JAFCCO) [Venture Capital Bank, 57.2%; Al-Fares Investments, 17.8%, Jordan Phosphate Mines Co. p.l.c. (JMPC), 15%; Arab Mining Co., 10%]	Aqaba	132,000
Do.	Jordan Phosphate Mines Co. p.l.c. (JPMC)	do.	1,100,000
Do.	Jordan Indian Fertilizer Co. (JIFCO) [Indian Farmers Fertilizers Cooperative of India (IFFCO), 52%, and Jordan Phosphate Mines Co. p.l.c. (JPMC), 48%]	Eshidiya	1,500,000
Do.	Indo-Jordan Chemicals Co. [Jordan Phosphate Mines Co. p.l.c. (JPMC), 87%, and Arab Investment Co., 13%]	do.	730,000
Zeolites	Amana Agricultural & Industrial Co.	Tel Hesban	NA
Do.	Green Technology Group of Jordan for Mining	Al Aritayn/Al-Mafraq	NA
Do.	Jordanian Factory for Soil Development & Moisture Drying Co.	do.	NA

Do., do. Ditto. NA Not available.

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THE MINERAL INDUSTRY OF KUWAIT

By Philip M. Mobbs[1]

Kuwait's economy was dominated by the production and refining of hydrocarbons. In 2013, crude oil exports accounted for about 95% of total exports and about 94% of Government revenue (Central Bank of Kuwait, 2014, tables 26, 35).

Under Article 21 of the Constitution, the state owns all natural resources. Article 152 of the Constitution authorizes limited-time-period concessions for the exploitation of natural resources. Decree law No. 6 of 1980 authorizes Kuwait Petroleum Corp. (KPC) to form partnerships with other companies to conduct petroleum sector activity. Environmental issues (including those associated with the manufacturing of aluminum, gold, and steel articles; cement production and storage; and the exploration for and production, storage, and transport of natural gas, petroleum, and sand) are covered by law No. 21 of 1995, law No. 16 of 1996, and decision No. 210 of 2001.

In 2013, Kuwait's total exports were valued at about $116 billion[2] compared with about $119 billion in 2012. Crude oil exports were valued at about $109 billion in 2013 compared with about $113 billion in 2012. The average price of Kuwait Export, which was a 31.4° API gravity, sour (2.52% sulfur content) reference crude oil, decreased to $105.04 per barrel in 2013 from $108.93 per barrel in 2012, according to data published by the Organization of the Petroleum Exporting Countries (2014, p. 6). Consequently, much of the decrease in the value of total exports from Kuwait was attributable to the decrease in the average price of exported crude oil. Kuwaiti exports to the United States were valued at $12.6 billion in 2013, of which crude oil accounted for $12.3 billion (Central Bank of Kuwait, 2014, tables 23, 35; U.S. Census Bureau, 2014b; U.S. Energy Information Administration, 2013).

The total value of Kuwaiti imports in 2013 was about $30 billion compared with a revised value of about $28 billion in 2012. Kuwait's imports from the United States in 2013 were valued at about $2.6 billion, of which aluminum accounted for about $51 million; steelmaking materials, about $16 million; and inorganic chemicals, $14 million (Central Bank of Kuwait, 2014, tables 23, 35; U.S. Census Bureau, 2014a).

Production

Data on estimated mineral commodity production are in table 1.

Structure of the Mineral Industry

KPC, the Ministry of Oil, and the Supreme Petroleum Council are the Government organizations that are responsible for the petroleum sector in Kuwait. KPC subsidiaries included Kuwait Oil Co. K.S.C. (KOC), which managed the country's crude oil and natural gas operations; Kuwait Gulf Oil Co., which managed primarily offshore crude oil and natural gas operations in the Partitioned Neutral Zone between Kuwait and Saudi Arabia (which also is known as the Divided Zone); Petrochemical Industries Co. K.S.C., which dominated the Kuwaiti fertilizer-manufacturing sector; and Kuwait National Petroleum Co. K.S.C. (KNPC), which operated the country's petroleum refineries. State-owned Kuwait Investment Authority held interests in Kuwaiti cement companies and manufacturers of steel pipe. Privately owned companies were active in the industrial minerals and metals sectors.

Commodity Review

Mineral Fuels

Petroleum and Natural Gas.—KPC continued to focus on increasing its production of crude oil and natural gas. Projects included ongoing planning of the heavy oil project in the Lower Fars field in northern Kuwait and a steam injection trial in the Wafra Joint Operations Area in the Partitioned Neutral Zone. KPC also planned to drill more wells to produce primarily natural gas. Historically, natural gas had been a coproduct of crude oil production in Kuwait (Kuwait Petroleum Corp., 2013, p. 16–17, 22–24).

KNPC continued work on the consolidation and expansion of the 466,000-barrel-per-day (bbl/d)-capacity Mina Al-Ahmadi refinery and the 270,000-bbl/d-capacity Mina Abdullah refinery to form a single 800,000-bbl/d-capacity refinery. The project was expected to be completed in 2018. KNPC also began site preparation for the new 615,000-bbl/d-capacity oil refinery at Al-Zour. KNPC expected to complete the installation of the fourth gas liquefaction train at the Mina Al-Ahmadi refinery by 2014. The gas liquefaction train would separate and condense liquefied petroleum gas (LPG) composed of butane and propane, and also natural gasoline from the wet natural gas stream that the refinery received from KOC. Preparations to add a fifth LPG train at Mina Al-Ahmadi by 2017 also were underway. Preliminary work on a planned liquefied natural gas (LNG) import terminal at Al-Zour was underway. The LNG was expected to supplement the local gas supply used for electricity generation during the summer's peak demand period (Kuwait National Petroleum Co. K.S.C., 2013, p. 23–26).

Outlook

Strong domestic demand for aggregate, cement, electrical power, glass, sand, and steel for infrastructure projects is expected to continue in the near future. A number of additional electricity-generating powerplants have been proposed.

[1]Deceased.

[2]Where necessary, values have been converted from Kuwaiti dinars (KWD) to U.S. dollars (US$) at the average rate of KWD0.2826=US$1.00 for 2013 and KWD0.27996=US$1.00 for 2012.

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The powerplants could be fueled by natural gas obtained from development of known nonassociated natural gas reservoirs and increased use of domestically produced natural gas. The proposed new powerplants could provide electrical power for proposed industrial diversification and expansion projects in Kuwait and shift some volume of refined petroleum products, such as fuel oil that is currently (2013) used to fuel electricity-generating powerplants, to the export market. The ongoing expansion of the Kuwaiti petroleum production capacity (subject to the Organization of the Petroleum Exporting Countries' crude oil production allocation) is expected to continue.

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TABLE 1

KUWAIT: ESTIMATED PRODUCTION OF MINERAL COMMODITIES[1,2]

(Metric tons unless otherwise specified)

Commodity[3]		2009	2010	2011	2012	2013
Cement		2,000,000	2,000,000	2,250,000	2,250,000	2,250,000
Iron and steel:						
Crude		450,000	500,000	800,000	1,300,000	1,500,000
Rolled-steel bar		600,000	650,000	1,100,000	1,300,000	1,300,000
Lime, hydrated and quicklime		45,000	50,000	50,000	50,000	50,000
Natural gas:[4]						
Gross	million cubic meters	13,000	13,500	16,000	18,000 r	18,000
Dry	do.	11,200	11,600	13,500	15,500 r	15,500
Nitrogen:						
N content of ammonia		470,000	380,000	520,000	490,000 r	500,000
N content of urea		450,000	340,000	460,000	405,000 r	420,000
Petroleum:						
Crude[4]	thousand 42-gallon barrels	880,000	950,000	1,000,000	1,150,000 r	1,140,000
Natural gas liquids and liquefied petroleum gases	do.	54,000	63,000 r	68,000 r	71,000 r	71,000
Refinery products:						
Gasoline (motor), naphtha, and reformate	do.	78,000	78,000	76,000 r	79,000 r	80,000
Kerosene	do.	62,000	65,000	62,000 r	67,000 r	68,000
Distillate fuel oil	do.	95,000	89,000	88,000 r	96,000 r	97,000
Residual fuel oil	do.	74,000	69,000	64,000 r	73,000 r	74,000
Other[5]	do.	26,000	26,000	16,000 r	17,000 r	17,000
Total, including refinery gains and losses	do.	344,000	335,000	306,000 r	332,000 r	336,000
Salt		13,000	14,000	15,000	15,000	15,000
Sulfur:						
Elemental, petroleum byproduct		800,000	820,000	830,000	800,000	820,000
Sulfuric acid		17,000	18,000	18,000	18,000	18,000

rRevised. do. Ditto.

[1]Estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Table includes data available through June 27, 2014.

[3]In addition to commodities listed, secondary aluminum, chlorine, clays, glass, gypsum, methanol, and sand and gravel were produced, but available information is inadequate to make reliable estimates of output.

[4]Includes Kuwait's share of production from the Partitioned Neutral Zone.

[5]Includes bitumen and petroleum coke.

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TABLE 2
KUWAIT: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum, secondary		Arabian Light Metals Co. K.S.C. (Kuwait Industries Co. Holding K.S.C.)	Ahmadi	NA
Cement:				
Clinker		Kuwait Cement Co. K.S.C. (Kuwait Investment Authority, 32%, and National Industries Group, 22.4%)	Kiln at Shuaiba	1,800,000
Do.		ACICO Industries Co. K.S.C.	do.	1,000,000
Gray portland		Kuwait Cement Co. K.S.C. (Kuwait Investment Authority, 32%, and National Industries Group, 22.4%)	Mill at Shuaiba	2,200,000
Do.		ACICO Industries Co. K.S.C.	do.	1,000,000
Do.		Hilal Cement Co. K.S.C.C. (Suez Cement Co., 51%)	Sulaibiya industrial area	(1)
Do.		Kuwait Portland Cement Co. K.S.C.C.	Shuwaikh	(1)
White		Kuwait Cement Co. K.S.C. (Kuwait Investment Authority, 32%, and National Industries Group, 22.4%)	Kiln and mill at Shuaiba	170,000
Iron and steel, steel:				
Crude		Al Oula Steel Manufacturing Co. K.S.C.	Shuaiba	500,000
Do.		United Steel Industrial Co. K.S.C.C. (Joint venture of local investors and Ahwaz Steel Commercial and Technical Services GmbH)	Melt shop at Shuaiba	1,000,000
Rolled:				
Bar and rod		do.	Rolling mill at Shuaiba	1,200,000
Do.		Kuwait Reinforcement Steel Manufacturing Co. (Ali Al-Sarraf International Group Co.)	do.	400,000
Pipes		Kuwait Pipes Industries and Oil Services Co. K.S.C.	Pipe mill at Sulaibiya industrial area	120,000
Do.		do.	Pipe mill at Shuwaikh	65,000
Liquefied natural gas	million cubic meters per day	Kuwait National Petroleum Co. K.S.C. (KNPC) [Kuwait Petroleum Corp. (KPC), 100%]	Mina Al-Ahmadi GasPort® import facility, Mina Al-Ahmadi	17 [2]
Natural gas	million cubic meters	Various[3]	Various fields	17,000
Natural gas liquids		Kuwait Oil Co. K.S.C. (KOC) [Kuwait Petroleum Corp. (KPC), 100%]	do.	65,000 [4]
Nitrogen:				
Ammonia		Petrochemical Industries Co. K.S.C. [Kuwait Petroleum Corp. (KPC), 100%]	Plant B, Shuaiba	657,000
Urea		do.	Plants A and B, Shuaiba	1,000,000
Petroleum:				
Coke, calcined		do.	Shuaiba	350,000
Crude	42-gallon barrels per day	Kuwait Oil Co. K.S.C. (KOC) [Kuwait Petroleum Corp. (KPC), 100%]	Southern and eastern fields (Burgan, Khasman, and Madina fields)	1,350,000
Do.	do.	Al-Khafji Joint Operations (Kuwait Gulf Oil Co., 50%, and Aramco Gulf Operations Co., 50%)	Khafji field, offshore Partitioned Neutral Zone	600,000
Do.	do.	Kuwait Oil Co. K.S.C. (KOC) [Kuwait Petroleum Corp. (KPC), 100%]	Northern fields (Abdali, Bahra, Ratqa, Matraba, Raudhatain, and Sabiya fields)	559,000
Do.	do.	do.	Western fields (Abdaliya, Kra' Al-Mero, Managish, and Umm Gudair fields)	427,000
Do.	do.	do.	South Fuwaris and South Umm Gudair fields, onshore Partitioned Neutral Zone	80,000

See footnotes at end of the table.

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TABLE 2—Continued
KUWAIT: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum—Continued:				
Crude—Continued	42-gallon barrels per day	Kuwait Oil Co. K.S.C. (KOC) [Kuwait Petroleum Corp. (KPC), 100%] and Saudi Arabian Chevron Inc. (Chevron Corp., 100%)	Wafra field, onshore Partitioned Neutral Zone	80,000
Do.	do.	Kuwait Gulf Oil Co. [Kuwait Petroleum Corp. (KPC), 100%]	Hout field, offshore Partitioned Neutral Zone	NA
Refined products	do.	Kuwait National Petroleum Co. K.S.C. (KNPC) [Kuwait Petroleum Corp. (KPC), 100%]	Mina Al-Ahmadi refinery	466,000
Do.	do.	do.	Mina Abdulla refinery	270,000
Do.	do.	do.	Shuaiba refinery	200,000
Salt		Al Kout Industrial Projects Co. K.S.S.C.	Shuaiba	NA
Sulfur		Kuwait National Petroleum Co. K.S.C. (KNPC) [Kuwait Petroleum Corp. (KPC), 100%]	Mina Abdulla, Mina Al-Ahmadi, and Shuaiba refineries	990,000
Do.		Kuwait Sulphuric Acid Co.	Safat	18,000

Do., do. Ditto. NA Not available.
[1]Marketed imported bulk cement.
[2]Seasonal operations, typically April through October.
[3]Some natural gas is produced and recovered from most crude oil production operations in Kuwait and the Partitioned Neutral Zone. Nonassociated natural gas was produced from the Sabriyah field.
[4]Includes refinery-produced liquefied petroleum gases.

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The Mineral Industry of Lebanon

By Mowafa Taib

Lebanon is one of the smallest countries in the Middle East region with an area of only 10,400 square kilometers (km^2). In 2013, the country was not an important producer of minerals but was active in trading of mineral commodities, such as diamond, gold, ferrous and nonferrous scrap metals, fertilizers, and hydrocarbon products. In terms of tonnage, limestone for cement was the country's leading mineral commodity. Other industrial minerals produced in Lebanon included fertilizer, gypsum, lime, limestone, and salt. Most of the country's output of minerals was used locally in the agriculture and construction sectors, and the remainder was exported (Ministry of Finance, 2014; U.S. Central Intelligence Agency, 2014).

Government Policies and Programs

In 2013, the Government took additional steps to develop its share of offshore crude oil and natural gas resources following the discovery of an estimated 1.69 billion barrels of crude oil, 3.47 trillion cubic meters of recoverable natural gas, and 87 billion cubic meters of natural gas liquids in the Levant Basin, which is located along the coasts of Cyprus, Israel, Lebanon, and Syria in the Mediterranean Sea. The Government estimated the country to have resources of 850 million barrels of crude oil and 2.7 trillion cubic meters of natural gas (MEED, 2014). The country's first hydrocarbon law, the Offshore Petroleum Law, was approved by the Cabinet on August 17, 2011. In 2012, the Government had created the Petroleum Administration Authority under the Ministry of Energy and Water to manage the offshore exploration for hydrocarbons in a 22,730-km^2 area located in the eastern Mediterranean Sea along the Lebanese coast. In February, the Government started prequalifying interested companies for its first offshore crude oil and natural gas bidding round and was expected to make the final selections by 2014 and to begin exploration in 2017. More than 50 companies submitted prequalification documents for the bidding round (U.S. Geological Survey, 2010; Mirza, 2013; U.S. Energy Information Administration, 2014).

Minerals in the National Economy

The Lebanese economy was dominated by services sector activity, which contributed 75.4% of the gross domestic product (GDP), or $64.3 billion, in 2013. The industrial and agricultural sectors contributed 20.0% and 4.6%, respectively. The Lebanese economy grew at a rate of 1.5% in 2013 compared with a growth rate of 2.5% in 2012 following 4 years of an average annual growth rate of 7.8%. The slow economic growth in recent years was attributed to the collapse of the Government in early 2011 because of its support of the Special Tribunal for Lebanon and the conflict in neighboring Syria. The conflict in Syria had four main effects on the country's economy: (1) it was a cause of sectarian tensions in many Lebanese towns and cities; (2) it forced more then 1 million people to seek refuge in Lebanon, thus increasing the country's population by about 20%; (3) it increased investment risk, thereby making it difficult for regional and international investors to invest in large projects in Lebanon because of political instability and the interdependence of the Lebanese and Syrian economies; and (4) it disrupted the transport of merchandise through Lebanon's ports to and from other countries in the Middle East by way of Syria (Bank Audi S.A.L., 2014, p. 4, 12; International Monetary Fund, 2014, p. 96).

Mineral Trade

In 2013, the value of Lebanon's total exports decreased by 12% to $3.94 billion from $4.48 billion in 2012. Exports of pearls and precious and semiprecious metals accounted for 20% of the total value of exports compared with 38% in 2012; exports of metallic products accounted for 13% of the total value of exports compared with 10% in 2011; and exports of chemical products, which included fertilizers, accounted for 8% of the total value of exports in 2012 and 2013. The volume of phosphate fertilizer exports was estimated by the Arab Fertilizer Association to be 310,000 metric tons (t) in 2012 and 2013. Lebanon's major export markets were, in terms of the value of exports, Syria (13%), Saudi Arabia (9%), the United Arab Emirates (8%), Iraq (7%), Turkey (5%), and Switzerland (4%) (Arab Fertilizer Association, 2014, p. 49; Ministry of Finance, 2014, p. 6–7, 12–13).

The total value of Lebanon's imports decreased slightly to $21.23 billion in 2013 from $21.28 billion in 2012. The value of imports of mineral products (mainly mineral fuels) accounted for 24% of imports compared with 28% in 2012; chemical products, 9% of total imports compared with 8% in 2012; and metals and metal products, 8% of total imports compared with 7% in 2012. China was Lebanon's leading source of imports, accounting for 11% of total imports, followed by Italy (8%), France and the United States (7% each), Germany (6%), Russia (4%), and the United Kingdom (3%) (Ministry of Finance, 2014, p. 4–5, 12–13).

Production

Lebanon's cement output is typically well documented by financial institutions and the industrial sector because it is used as an indicator of the country's construction sector activity. In 2013, cement output was reported to have increased by 10% to 5.8 million metric tons (Mt) from 5.3 Mt in 2012. Production of other industrial mineral commodities, such as fertilizer, gypsum, and sulfuric acid, was estimated from known production capacities because of a lack of reliable reported production data (table 1).

Structure of the Mineral Industry

All mineral production activities in Lebanon were carried out by private companies. Cement producers in Lebanon included Ciment de Sibline S.A.L. (majority owned by Secil-Companhia Geral de Cale e Cimento S.A. of Portugal), Cimenterie du Moyen-

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Orient S.A.L., Cimenterie Nationale S.A.L. (Alsabeh Cement), Holcim (Liban) S.A.L (a subsidiary of Holcim Ltd. of Switzerland), and Société Libanaise des Ciments Blancs S.A.L. (a subsidiary of Holcim Ltd.). Lebanon Chemicals Company S.A.L. (LCC), which was the sole producer of fertilizer and other chemicals in the country, changed its name to Selaata Chemicals Co. S.A.L. (SCC) in 2012. The company produced aluminum sulfate, monocalcium phosphate, phosphoric acid, sulfuric acid, and triple superphosphate fertilizer. Attar Steel Co., Demco Steel Industries S.A.L., and Societé Industrielle Libanaise S.A.L. carried out production of rolled steel and steel pipes. Diametal S.A.L. was among the first companies in the Middle East to produce shredded and heavy melting scrap. Lebanese Salt Palace Co. S.A.R.L. and Nepton Salt Co. S.A.L. at Enfeh in northern Lebanon produced salt (table 2; Diametal S.A.L., 2014).

Commodity Review

Metals

Iron and Steel.—In 2013, iron and steel production in Lebanon included hot-rolled steel and steel pipes as well as other finished steel products from imported crude steel. Lebanon's consumption of finished steel products exceeded local production, which made the country reliant on imports for all its crude steel and more than one-half of its semifinished and finished steel products. Production of hot-rolled steel products was estimated to be 500,000 t in 2013. Scrap was the main steel product exported by Lebanon. Scrap exports increased to 408,000 t in 2013 from 365,000 t in 2012. The country also exported 24,000 t of semifinished and finished steel products. Steel imports decreased by one-half to 1.5 Mt in 2013 from 3.0 Mt in 2012, and included 149,000 t of ingot and semifinished steel, about 1.1 Mt of reinforcing steel bar, 248,000 t of flat steel, and 23,000 t of tabular steel products. The top exporters of steel products to Lebanon were, in descending order of export value, Ukraine, Turkey, China, Egypt, and Italy (Bank Med S.A.L., 2013; World Steel Association, 2014, p. 57, 66, 72, 107).

Lead.—No lead was mined in Lebanon in 2013; however, at least two lead processing facilities were operating in the country. The estimated volume of secondary lead produced in the country in 2013 was 6,000 t, which was 20% more than in 2012. The two small-scale smelters responsible for secondary lead production were Arabay Trading and Industrial S.A.L. and National Ammunition Co. (tables 1 and 2).

Industrial Minerals

Diamond.—Although diamond has never been mined in Lebanon, the country had an active diamond cutting and polishing industry and also traded in diamond. No reliable information was available on the country's cutting and polishing activities. According to the Kimberley Process Certification Scheme's latest statistics, Lebanon's diamond exports decreased by about 65% in value and 56% in volume in 2013 compared with those of 2012. Exports of rough and polished diamond were 311,628 carats valued at $44 million in 2013 compared with 704,390 carats valued at more than $125 million in 2012 and 1,104,935 carats valued at $296 million in 2011. Similarly, diamond imports decreased by 54% in volume and 57% in value compared with those of 2012. Lebanon imported 311,513 carats of diamond valued at about $49 million in 2013 compared with 683,390 carats worth about $113 million in 2012 and 1,177,960 carats worth about $205 million in 2011 (Kimberley Process Certification Scheme, 2014).

Mineral Fuels

Natural Gas and Petroleum.—The Ministry of Energy delayed the auction of licenses for offshore oil and gas exploration and exploitation in its territorial waters several times in 2013. These delays were attributed to the Government needing more time to establish the legal and administrative framework for these activities, which would be taking place in the country for the first time. Another reason for the delays was related to the dispute with Israel over the demarcation of the southern boundary of Lebanon's territorial waters. The disputed region, which is located near the center of the Levant Basin, covers more than 477 km^2 and may hold substantial hydrocarbon resources. The Ministry of Energy and Water expected to complete the prequalification bid for 10 offshore blocks by January 2014, to finalize the selection process by the end of 2014, and begin exploration in 2017. Fifty-two companies submitted documents for prequalification for the bidding round, among which were Chevron Corp. and Exxon Mobil Corp. of the United States, Royal Dutch Shell plc of the United Kingdom, and Total S.A. of France (Baxter, 2013; U.S. Energy Information Administration, 2013, 2014).

Outlook

The development of Lebanon's offshore hydrocarbon resources in the Levant Basin and the start of production in 2020 could provide a long-term supply of crude oil and natural gas to the country and subsequently stimulate its mineral industry. The Government, however, is not expected to be able to spend large amounts of funds on infrastructure projects because of the high public debt, which is equivalent to 120% of the country's GDP (U.S. Central Intelligence Agency, 2014).

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TABLE 1
LEBANON: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
METALS						
Iron and steel:[e]						
Hot-rolled		200,000	200,000	300,000	500,000	500,000
Pipes		200,000	200,000	200,000	300,000	300,000
Lead, secondary		5,000	6,000	6,000	5,000	6,000
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	4,897	5,227	5,550	5,309	5,831
Gypsum[e]	do.	100	105	105	105	110
Lime[e]	do.	250	250	250	250	270
Limestone, for cement[e]	do.	6,400	7,000	7,000	7,000	7,500
Phosphate, P_2O_5 equivalent:						
Phosphatic fertilizers		73,000	270,000	310,000	310,000	310,000
Phosphoric acid		51,000	60,000	60,000	60,000	60,000
Salt[e]		20,000	20,000	20,000	20,000	15,000
Sulfuric acid:[e]						
Gross weight		500,000	600,000	600,000	600,000	500,000
S content		164,000	196,000	196,000	196,000	164,000

[e]Estimates; estimated data are rounded to no more than three significant digits. do. Ditto.
[1]Table includes data available through December 31, 2014.
[2]In addition to the commodities listed, ammonium sulfate, granite, gravel, marble, sand, and other construction materials were also produced, but quantities are not reported, and available information was inadequate to make reliable estimates of output.

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TABLE 2
LEBANON: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum sulfate	Selaata Chemicals Company S.A.L.	Selaata	30
Cement	Holcim (Liban) S.A.L. (Holcim Ltd., 52.00%; Mershed Baaklini, 14.98%; Seament Holding S.A.L., 7.50%; individual investors, 21.39%)	Chekka	2,900
Do.	Cimenterie Nationale S.A.L.	do.	2,800
Do.	Ciment de Sibline S.A.L. (Secil-Companhia Geral de Cale e Cimento S.A., 50.5%; Bank Med, 20%; Walid Jumblatt, 20%)	Sibline	1,277
Do.	Cimenterie du Moyen-Orient S.A.L. (Seament Holding S.A.L.)	Chekka	500
Do.	Société Libanaise des Ciments Blancs S.A.L. (Holcim Ltd., 52%)	do.	100
Granite and marble	Arabian Mining Habre & Co. S.A.L.	Kahaleh, Baabda	NA
Do.	Wadih Tadros & Fils Co.	Kafarchima	NA
Do.	Société Nationale de Marbre	Mar Elias, Btina	NA
Do.	Marble & Cement Products S.A.L.	Bekaa	NA
Do.	Boustani, Mallah & Co. SARL	Kesrouan	NA
Gypsum	Sodap Liban S.A.L.	Hosrayel, Jebeil	30
Iron and steel, steel:[1]			
Rolled	Attar Steel Co.	Beirut	200
Do.	Societé Industrielle Libanaise S.A.L.	Southern Metn	NA
Pipes	Demco Steel Industries S.A.L.	do.	200
Do.	Tandem Tubes S.A.L. (Tannous Group)	Hosrayel, Jebeil	NA
Scrap:			
Shredded	Diametal S.A.L.	Mkalles	100
Heavily melted	do.	do.	200
Wire	Steel Wire Lebanon S.A.L. (Tannous Group)	Hosrayel, Jebeil	NA
Lead, secondary	National Ammunition Co.	Daraya, Kesserwan	NA
Do.	Arabay Trading and Industrial S.A.L.	Tannayel, Bekaa	NA
Lime	Société des Chaux et Plâtres du Liban S.A.L.	Chekka	250
Phosphate fertilizer:	Selaata Chemicals Company S.A.L. (SCC)	Selaata	NA
Single superphosphate	do.	do.	120
Triple superphosphate	do.	do.	220
Phosphoric acid	do.	do.	165
Salt	Nepton Salt Co. S.A.L.	Enfeh	10
Do.	Lebanese Salt Palace Co. S.A.R.L	do.	10
Sulfuric acid	Selaata Chemicals Company S.A.L.	Selaata	600

Do., do. Ditto. NA Not available.

[1]Lebanon's only steel mill, which was owned and operated by Consolidate Steel Lebanon S.A.L., was shut down in 2003.

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The Mineral Industry of Oman

By Mowafa Taib

The Sultanate of Oman was the leading crude oil producer in the Middle East that was not a member of the Organization of the Petroleum Exporting Countries (OPEC). Oman is one of the countries that make up the Cooperation Council for the Arab States of the Gulf, better known as the Gulf Cooperation Council (GCC). In 2013, the country was the seventh-ranked producer of crude oil and the fifth-ranked producer of natural gas in the Middle East and accounted for about 1.1% of the world's crude oil production and 0.9% of the world's production of natural gas. In addition to fuel minerals, Oman supplied the world with such mineral commodities as ammonia, chromium, copper, gypsum, manganese, primary and secondary aluminum products, and urea. The country also produced cement, crude steel, direct-reduced iron (DRI), limestone, kaolin, laterite (low-iron ore), marble, quartz, salt, sand and gravel, and silica, which were mainly consumed locally (table 1; BP p.l.c., 2014, p. 10, 22).

Although copper mining has been ongoing in the Al Batinah region of Oman for about 6,000 years, much of the country's mineral resources remain unexploited or underexploited. Oman's mountainous region, which is located in the northern part of the country, hosts the Semail ophiolites, which are intact and exposed ophiolites likely to contain deposits of such metals as chromium, cobalt, copper, gold, lead, magnesium, manganese, nickel, palladium, platinum, silver, vanadium, and zinc (Mawarid Mining Co. L.L.C., 2014).

Minerals in the National Economy

The nominal value of Oman's gross domestic product (GDP) increased to $80.6 billion in 2013 from $78.3 billion in 2012. The real economic growth rate was 5.1% in 2013 compared with 5.0% in 2012. The value of the crude oil sector activity accounted for 45.9% of the GDP; the industrial sector, 17.6% of the GDP; and the natural gas sector, 3.8% of the GDP. Oman's economic growth was driven by increases in the amount of crude oil and natural gas production as well as continued high crude oil prices, which averaged $105.51 per barrel in 2012 and $109.61 per barrel in 2011. The Omani economy continued to be highly dependent on hydrocarbon revenues. During the 5-year period from 2008 to 2012, the value of hydrocarbon exports averaged about 70% of total exports and hydrocarbon revenue accounted for more than 80% of Government revenue. In 2013, the share of the non-oil industrial sector, which included aluminum, nitrogen fertilizer, and steel manufacturing, in the overall GDP was 17%. Manufacturing made up 60.5% of the value of the non-oil industrial sector followed by construction (30.4%), electricity and water supply (7.1%), and mining (2%). The value of mining and quarrying increased by 6.6% in 2013 compared with that in 2012 (Central Bank of Oman, 2014, p. 20, 22; International Monetary Fund, 2014, p. 10).

Government Policies and Programs

The Government's economic policy was focused on industrial diversification to achieve sustainable economic growth and reduced dependence on crude oil exports. The Government's goals for economic diversification included that the contribution of the non-oil sectors (including the natural gas sector) to the country's economy increase to 91% the GDP and that non-oil exports increase to 13% of the GDP by 2020. The Government had been investing in the mineral industry by investing in primary and secondary aluminum production and developing Oman's metal and industrial mineral resources. In 2008, the Government established Takamul Investment Co. S.A.O.C. to fund manufacturing and processing facilities that could add more value to hydrocarbons, metals, and other mineral commodities produced in Oman. Takamul was owned by Oman Oil Co. S.A.O.C. (OOC) (93.07%), along with the Abu Dhabi Water and Electricity Authority (5.01%) and Al Maha Strategic Industries for Investments L.L.C. (1.92%), the latter two of which were headquartered in the United Arab Emirates (UAE). Takamul financed several metal, mineral, and petrochemical production projects in the country, including Gulf Specialty Steel Industries L.L.C. (GSSI), Oman Aluminium Processing Industries L.L.C. (OAPIL), Oman Aluminium Rolling Co. (OARC), and Sohar Sulphur Fertilizers L.L.C. (SSF). Takamul was considering financing the development of new aluminum and steel beneficiation projects as well as ferrochrome, magnesium, salt, and silicon production projects (Takamul Investment Co. S.A.O.C., 2014a, b).

During 2013, the Government stopped accepting new applications for mining licenses while it conducted a comprehensive review of the country's mineral industry. The purpose of the review was to ensure that best practices were applied in the development of the country's mineral resources and to inform Government decisionmakers on how best to update the rules and regulations that govern Oman's mineral sector. The Government intended to give priority to mining projects that include a value-added component for any mineral commodity produced in the country. The Ministry of Commerce and Mining, which is responsible for regulating quarrying and mining activities in Oman, closed several sites that were designated for the production of construction aggregate, chromite, and marble because the operators had allegedly violated the terms of their mining and (or) quarrying licenses, including quarrying and mining for industrial minerals that were not covered by their licenses. An advisory committee, which included representatives from nine Government agencies, was formed to investigate mining issues in the country. The committee decided that quarrying and mining licenses would be issued only to companies that are jointly owned by at least 35 citizens of Oman. The committee also decided that mining companies should reinvest 5% of their profits back into welfare

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projects in the local communities (Khan, 2012; Gulf News, 2013; Central Bank of Oman, 2014, p. 47).

Mining law No. 27 of 2003 and its amendments grants the Government [represented by the Ministry of Commerce and Industry (MCI)] ownership of all minerals wherever they are found in Oman. The MCI administers mining activities in the country and is responsible for issuing mining licenses, resolving mining sector disputes, and protecting the environment. Mining permits are issued to Omani companies and individuals as well as to foreign companies registered according to the commercial companies law No. 4 of 1974. Prospecting permits are for up to 5 years, and mining permits are issued for up to 25 years; both mining and prospecting permits are renewable (Ministry of Commerce and Industry, 2014).

Structure of the Mineral Industry

The Ministry of Oil and Gas manages the country's hydrocarbon sector; however, the ultimate decision on the country's hydrocarbon policy and investment is decreed by the Sultan of Oman. Hydrocarbon sector policies are carried out by Petroleum Development Oman L.L.C. (PDO), which is owned by the Government (60%), Royal Dutch Shell plc of the Netherlands (34%), Total S.A. of France (4%), and Partex (Oman) Corp. of Panama (2%). PDO holds more than 90% of the country's oil reserves and produces more than 70% of the country's crude oil and almost all its natural gas. The Government owns 100% of OOC, 75% of Oman Oil Refineries and Petroleum Industries Co. (ORPIC), 51% of Oman Liquefied Natural Gas L.L.C., and 46.84% of Qalhat Liquefied Natural Gas S.A.O.C. (U.S. Energy Information Administration, 2013; Oman Oil Co. S.A.O.C., 2014).

OOC owned a 40% share in Sohar Aluminium Co. L.L.C., which was the sole primary aluminum producer in Oman, a 30% share in Vale Oman Pelletizing Co. L.L.C. (VOPC), and a 25% share in Black Rock Metals Co. Oman India Fertiliser Co. S.A.O.G (OMIFCO), which was a joint venture of OOC (50%), Indian Farmers Fertiliser Cooperative Ltd. (25%), and Krishak Bharati Cooperative Ltd. (25%), produced nitrogen fertilizer. The other producer of nitrogen fertilizer in Oman was Sohar International Urea & Chemical Industries S.A.O.G. (SIUCI), which was a wholly owned subsidiary of Suhail Bahwan Group (Oman India Fertiliser Co. S.A.O.C., 2014; Sohar Aluminium Co. L.L.C., 2014; Suhail Bahwan Group, 2014).

Al Madinah Cement Co. L.L.C, Oman Cement Co. S.A.O.C., and Raysut Cement Co. S.A.O.C. (RCC) were the main producers of cement in Oman. Several small-, medium-, and large-size companies produced chromite in 2013, including Al Tamman Trading Establishment L.L.C., Gulf Mining and Materials Co., Hatton FZE, Northern Minerals Co. L.L.C., and Oman Chromite Co. S.A.O.G. Copper was produced by Mawarid Mining L.L.C., which was a wholly owned subsidiary of MB Holding Co. L.L.C. (table 2).

Mineral Trade

In 2013, Oman's total exports increased in value by about 11% compared with a 29% increase in 2012. The increase in 2013 was attributable mainly to an 8.7% increase in the volume of crude oil output compared with that of 2012. The volume of Omani crude oil exports increased to 304.2 million barrels (Mbbl) in 2013 from 279.8 Mbbl in 2012. Crude and refined oil and natural gas accounted for about 80% of Oman's goods exports (including reexports). The value of liquefied natural gas (LNG) exports increased by about 3.4% in 2013 compared with that of 2012. The value of refined petroleum products exports decreased by about 39% compared with a decrease of 20% in 2012. Oman exported 8.9 million metric tons (Mt) of LNG and 268,000 metric tons (t) (3.1 Mbbl) of natural gas liquids (NGL). The value of non-oil exports increased by 5.9% compared with that of 2012; this increase was owing mainly to a 28% increase in the value of mineral products and about a 29% increase in the value of base-metal and base-metal-related articles compared with those of 2012. The value of chemical products (which include fertilizers) increased by about 128% compared with the value in 2012 (Central Bank of Oman, 2014, p. 43–46, 104, 107).

The value of U.S. exports of goods to Oman decreased by about 10% to $1.57 billion in 2013 from $1.75 billion in 2012. The main export categories were passenger cars ($411 million), drilling and oilfield equipment ($157 million), chemicals ($121 million), aircraft ($87 million), and excavation machinery ($51 million). The value of U.S. imports from Oman decreased by about 24% to $1.02 billion from $1.36 billion in 2012. The significant decrease was attributed to the decrease in the value of crude oil imports, which amounted to only $98 million in 2013 compared with $364 million in 2012 and $1.65 billion in 2011. U.S. fertilizer imports (mainly urea) from Oman decreased to $239 million in 2013 from about $485 million in 2012, and imports of jewelry increased to $223 million in 2013 from $173 million in 2012 (U.S. Census Bureau, 2014).

Production

Notable increases in Oman's mineral production in 2013 compared with that of 2012 included that of gypsum, by 45%; chromite and manganese, 31% each; clay, 14%; and marble, 8%. Notable decreases in mineral output in 2013 compared with that of 2012 included that of copper mine output, by 45%; quartz, 44%; copper metal content, 50%; laterite, 19%; kaolin, 18%; limestone, 15%; refinery products, 8%; and sulfur, 14% (table 1).

Commodity Review

Metals

Aluminum.—The Sohar aluminum smelter, which was owned and operated by Sohar Aluminium, produced 354,000 t in 2013, which was a decrease of 1.7% compared with output in 2012. The company produced ingots, sows, and hot metal. The Sohar smelter used alumina imported from Australia by Oman Shipping Co. S.A.O.C., which had a long-term contract to ship 690,000 metric tons per year (t/yr) of alumina to Oman. The smelter employed more than 1,000 workers directly and 2,500 indirectly. Work on Sohar Aluminium's $3.0 billion phase 2 expansion project, which aimed to double the smelter's capacity

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to 720,000 t/yr from the current capacity of 360,000 t/yr, was underway. The phase 2 expansion project also included doubling the capacity of the existing 1,000-megawatt (MW) powerplant. The project was expected to be completed by yearend 2016 (Joseph, 2013; Sohar Aluminium Co. L.L.C., 2014).

Sixty percent of aluminum production at the Sohar smelter was used by the domestic market, and the remaining 40% was exported to China, India, and Malaysia. Several beneficiation plants were established in Oman to add value to the primary aluminum produced at the Sohar smelter to produce intermediate and manufactured aluminum products. In August, OARC completed the construction of an aluminum rolling mill at the Sohar Industrial Estate at a cost of $385 million. The mill, which was constructed by FATA EPC (a subsidiary of FATA S.p.A. of Italy), had the capacity to produce 140,000 t/yr of multipurpose rolled aluminum sheets. The mill was supplied with natural gas by OOC. At full production, the mill was expected to employ 275 people and to provide additional employment opportunities for several supporting businesses (Oman Aluminium Rolling Co., 2014; Sohar Aluminium Co. L.L.C., 2014).

OAPIL, which was a joint venture of Takamul and Oman Cables Industries, was located in the Sohar Industrial Estate near the Sohar aluminum smelter. OAPIL had been producing electrical conductivity rods using technology supplied by Southwire Co. of the United States (Takamul Investment Co. S.A.O.C., 2014a).

Antimony.—Strategic & Precious Metal Processing Co. (SPMP), which was a joint venture of Tristar Resources p.l.c. of the United Kingdom (40% interest), Oman Investment Fund (40% interest), and Castell Investments (20% interest), was building an antimony roasting plant at the Sohar Freezone. The pyrometallurgical plant, which was expected to be completed by 2016, would have the capacity to produce 20,000 t/yr of antimony metal and antimony trioxide and would cost $60 million to build. SPMP would recover antimony from concentrates supplied by Tristar and produced in Canada and Turkey as well as from concentrates from third parties to produce antimony metal ingots and antimony trioxide powder (Tristar Resources p.l.c., 2014).

Chromium.—Oman held about 2% of the world's chromite resources in its 450 chromite deposits. In 2013, Oman had more than 55 active chromite mining operations. The high number of chromite mining operations in Oman was attributed to the low cost of operating the mines because the shallow deposits allow for open pit mining, the moderate weather allows for year-round mining, and the infrastructure, which includes good roads and electricity, has long been developed. Oman's chromite ore output increased to 788,000 t in 2013 from 602,000 t in 2012. Gulf Mining Material Co. owned and operated Oman's first chromite ore concentration plant; the plant was located in the Ad Dakhiliyah region in Samail Wilaya in northern Oman. The plant had the capacity to produce 50,000 t/yr of chromium concentrate grading 38% chromium oxide (Cr_2O_3) or higher. In 2013, the company increased the plant's capacity to 180,000 t/yr (table 1; Gulf Mining Material Co., 2014).

In 2013, Al Tamman Indsil Ferro Chrome L.L.C., which was a 50–50 joint venture of Muscat Overseas Group (the parent company of Al Tamman) and Indsil Group of India, commissioned a 75,000-t/yr-capacity ferrochrome smelter in the Sohar Freezone. The smelter consisted of two 24-megavolt-ampere (MVA) furnaces that processed chromite ore to produce high-carbon ferrochrome. The company planned to double the smelter capacity to 150,000 t/yr by adding two more furnaces in 2014 (Al Tamman Indsil Ferro Chrome L.L.C., 2013; James, 2013).

Chromite ore feedstock was supplied by Al Tamman, which started chromite ore production from the Al Ram Mine in 2007. Chromite ore from the Al Ram open pit mine, which was located 140 kilometers (km) south of Muscat, had been shipped to China and India. The company estimated the mineral resources at the Al Ram Mine to be 1 Mt of chromite grading 38% Cr_2O_3. Annual production at the Al Ram Mine averaged 200,000 t. Al Tamman was also a partner in the Wadi Rajmi chromite mine. The mine was managed by Al Tamman and was located 320 km north of Muscat on the Muscat-Shinas Highway. The average annual production of chromite ore from the Wadi Rajmi open pit mine was 96,000 t, and mine's chromite ore reserves were estimated to be 1 Mt of ore grading 30% Cr_2O_3 (Al Tamman Trading Establishment L.L.C., 2014).

Metkore Alloys & Industries Ltd. of India had started preparation work for building a 150,000-t/yr-capacity ferrochrome smelter at the Sohar Freezone. The $100 million smelter, which was expected to commence production in 2014, would use chromite mined in Oman. The smelter's entire output would be exported to India (James, 2013).

Copper and Gold.—Copper mine output decreased significantly in 2013 compared with that of 2012. The decrease was attributed to the exhaustion of reserves at the Safwa Mine in 2012. Mawarid, which was the sole copper producer in Oman, operated the Ghuzayn open pit copper mine, which was expected to be mined until 2021. Mawarid held exploration and exploitation permits for Blocks 1 and 2, which are located in northwestern Sohar, and for the Ghuzayn Block. Mawarid completed a feasibility study for the Ghuzayn 2 and Ghuzayn 3 prospects where it had previously identified copper mineralization during the exploration phase. The combined measured and indicated mineral resources at the Ghuzayn 3 site were estimated to be about 8.4 Mt grading 1.95% copper. The Mandos deposit had an estimated combined measured and indicated resource of 8.2 Mt containing 1.48% copper. Mawarid owned and operated a 140-metric-ton-per-hour-throughput concentrator at Lasail, which is located 35 km west of Sohar. The concentrator increased the copper content to between 18% and 24% in the concentrate from between 2% and 3% in the mined copper ore. The OMC copper refinery, which was Government owned, refined mined copper as well as imported copper and sold copper concentrates (Mawarid Mining Co. L.L.C., 2014).

In 2013, Gentor Resources Inc. of Canada was negotiating with Savannah Resources p.l.c. of the United Kingdom to sell its Oman assets; an agreement was expected to be completed in 2014. Al Fairuz Mining L.L.C and Gentor Resources were exploring for copper and gold at Block 5 in northern Oman and targeting volcanogenic massive sulfide mineralization types similar to the Troodos massif in Cyprus. Under the agreement signed by the two companies, Gentor Resources would acquire

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a 65% interest in Al Fairuz Mining following the completion of a bankable feasibility study. Gentor Resources had a similar agreement in place with Al Zuhra L.L.C. for the copper and gold exploration in Block 6. Gentor would receive 70% of future earnings, and Al Zuhra, 30% (Gentor Resources Inc., 2012).

Alara Resources Ltd. of Australia had been exploring for copper and gold at the Daris and the Washinihi sites in recent years. Alara had created a joint venture, Daris Resources L.L.C., with Al Tamman to develop and explore for copper and gold in the Daris property (Block 7). The Daris property covers 587 square kilometers (km^2) and is located in Suwaiyq Wilayat in the Batinah region of Oman. Alara had the right to increase its interest in the project to 70% from 50%. The estimated measured plus indicated resources at the Daris East prospect were 240,024 t of copper sulfides (grading 2.37% copper) and 183,365 t of copper oxides (grading 0.72% copper) at a cutoff grade of 0.5% copper. The inferred resources were estimated to be 30,566 t of copper sulfides (grading 2.25% copper) and 1,712 t of copper oxides (grading 0.61% copper). The measured resources were 129,155 t of copper sulfides (grading 2.48% copper) and 96,526 of copper oxides (grading 0.77% copper) (Alara Resources Ltd., 2014).

Alara also formed a joint venture with Al Hadeetha Investment L.L.C. to develop the mineral resources of the Washihi-Mullaq-Al Ajal copper and gold project, which is located between about 80 km east to 160 km southeast of the Daris copper and gold project. The project includes three prospects (exploration licenses) that cover an area of about 80 km^2. As of yearend 2013, Alara's Joint Ore Reserves Committee (JORC)-compliant indicated resource estimate for the Washihi prospect was 7.16 Mt at grades of 0.87% copper and 0.17 gram per metric ton (g/t) gold and the inferred resource estimate was 7.77 Mt at grades of 0.67% copper and 0.2 g/t gold (Alara Resources Ltd., 2014).

Alara formed another joint venture with Al Tamman to explore for copper and gold in Block 8, which was adjacent to Block 7. The Awtad copper and gold project is located about 130 km southwest of Muscat and covers about 497 km^2. The project area lies in the Samail ophiolite belt in northern Oman that extends for more than 500 km. Alara conducted a scoping study targeting 0.5-million-metric-ton-per-year (Mt/yr) throughputs of copper and gold ore at the Awtad project and decided to withdraw from the project because of poor results compared with other projects in Oman (Alara Resources Ltd., 2012a, b; 2013).

Alara had completed a scoping study in 2012 on the viability of installing a copper processing plant at the Washihi site because Washihi was projected to have a longer life and larger resources than the Daris site. Alara evaluated development options for a combined Daris and Washihi copper and gold project and identified two options that include the potential for a heavy-media separation followed by a small- or large-scale conventional flotation circuit. The company was conducting an upgraded scoping study for both options; the study was expected to be completed in July 2014 (Alara Resources, Ltd., 2014).

Iron and Steel.—Jindal Steel and Power Ltd. of India was the sole producer of DRI and hot-briquetted iron at its Jindal Shadeed iron and steel plant located in the Sohar Industrial Estate. The plant's production capacity in 2013 was 1.5 Mt/yr. The company commissioned another 2-Mt/yr-capacity steel melt-shop in Sohar in the fourth quarter of 2013. The plant would be integrated with a new bar and rod mill that would have the capacity to produce 1 Mt/yr of steel bar and rod products (Muscat Daily, 2013; Jindal Shadeed Iron and Steel LLC, 2014).

Vale Oman Pelletizing Co. L.L.C. (VOPC), which was a subsidiary of Vale S.A. of Brazil, produced iron ore pellets at its two 4.5-Mt/yr-capacity units in Sohar from imported iron; the pellets were for use in DRI plants. The DRI pelletizing plants and the distribution center were located within the Sohar Industrial Estate. VOPC planned to double its pelletizing capacity in Oman to 18 Mt/yr from the current capacity of 9 Mt/yr. All iron ore for the pellet plants was shipped from Vale's iron ore mines in Brazil by way of four 400,000-t-capacity ore carriers that were built in China for Oman Shipping Co. The maritime terminal and distribution center, which was built by VOPC at Sohar Industrial Port, had a 40-Mt/yr throughput capacity (Vale S.A., 2014, p. 29).

In 2013, Gulf Specialty Steel Industries, which was a joint venture of Global Steel Industries Pte Ltd. of Singapore and Takamul, commissioned its steel wire plant in Sohar. The plant had the capacity to produce 60,000 t/yr of galvanized steel wire. Sun Metals L.L.C., which was a subsidiary of Sun Metal Group of the UAE, planned to build a $400 million steel plant in the Sur Industrial Estate. The plant was expected to have the capacity to produce 2.5 Mt/yr of steel products, including 1.2 Mt/yr of rebar and 1.15 Mt/yr of midsize steel products. The plant, which was to be completed by 2017, would include two electric-arc furnaces, two ladle refining furnaces, a billet caster, and a billet-and-bloom caster (Gulf Specialty Steel Industries, 2014; Muscat Daily, 2014).

Manganese.—Al Tamman was the sole producer of manganese in Oman in 2013. Manganese production at the Al Qabil open pit mine, which is located 220 km south of Muscat, increased to 39,000 t in 2013 from 38,000 t in 2012. The company had the capacity to produce 60,000 t/yr of ore containing 25% manganese. Al Tamman completed scoping studies, geologic mapping, and a topographic survey for manganese ore concessions in Al Mintirib, Al Mudhaybi, Al Qabil, and the Ja'alan sites in the Al Sharqiya region of Oman. Al Tamman was in talks with the Indsil Group of India to build a 100,000-t/yr manganese smelter at the Sohar Freezone to beneficiate the manganese produced from the Al Mintirib concession (Al Tamman Trading Establishment L.L.C., 2014).

Industrial Minerals

Gypsum.—Oman's output of gypsum increased to about 2.8 Mt in 2013 from 1.9 Mt in 2012 and 1.2 Mt in 2011. Gypsum production in Oman had been increasing steadily during the past 4 years. Gypsum resources were estimated to be about 950 Mt concentrated in the southern region of Oman, including 165 Mt of minable gypsum in the Shuwaymiyah area. In December, a new joint venture, Zawawi Gypsum L.L.C., between Zawawi Minerals L.L.C., (45% interest), Boral Ltd. of Australia (27.5% interest), and USG Corp. of the United States (27.5% interest) was created to develop the gypsum deposits in

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the Dhofar Governorate in southern Oman and to install a new plasterboard plant in the Salalah Freezone. The plasterboard plant was expected to begin production in the first quarter of 2015. The targeted markets for the output of this facility were East Africa, the Middle East, and India. Zawawi Gypsum expected to export up to 2 Mt of gypsum to India in each of the next 3 years. The project was estimated to create 320 jobs both directly and indirectly (table 1; Times News Service, 2014).

Lime.—In 2013, Carmeuse Majan Group of Belgium was building a greenfield lime plant at Salalah Freezone in Dhofar Governorate. When completed, the plant would have a total capacity of 1 Mt/yr of lime from eight 125,000-t/yr-capacity kilns. The project would be built in phases until the total production capacity of 1 Mt/yr is realized. Construction of the first kiln began in 2013, and production was expected to commence in the second half of 2014 (Carmeuse Majan Group, 2014).

Nitrogen.—OMIFCO and SIUCI produced and exported nitrogen fertilizer. OMIFCO produced about 1.4 Mt/yr of ammonia and 2.1 Mt/yr of granulated urea at its plant in the Sur Industrial Estate. OMIFCO's entire output was exported to India under a long-term take-or-pay offtake agreement. SIUCI produced ammonia and urea at its plant, which is located at the Sohar Industrial Estate. The plant's initial production capacity was 1.6 Mt/yr of granular urea. The project, which comprised a 2,000-metric-ton-per-day (t/d)-capacity ammonia production plant and two granular urea plants with a combined capacity of 3,500 t/d, was built by Mitsubishi Heavy Industries Fertilizer Project Contracting and Construction Co. L.L.C. (a subsidiary of Mitsubishi Heavy Industries Ltd. of Japan). Both plants used natural gas as a feedstock supplied by OOC (Oman India Fertiliser Co. S.A.O.C., 2014; Suhail Bahwan Group, 2014).

Rare Earths.—In December, Medallion Resources Ltd. of Canada completed 6-month extensions of the existing memoranda of understanding (MOUs) with Arab Mining Co. of Jordan and Takamul. The original MOUs, which had been signed in early 2013, committed Arab Mining, Medallion, and Takamul to explore the viability of financing, creating, and operating a monazite production project in Duqm Industrial City in southern Oman. Under Medallion's MOU with Takamul, the two companies would establish a joint venture of Medallion (60% interest) and Takamul (40% interest) to produce rare-earth elements. Each party would provide funding for the project proportional to its interest. Under the MOU between Medallion and Arab Mining, both parties would negotiate Arab Mining's investment or participation in a joint venture, which would be majority owned and operated by Medallion and focused on rare-earth production and processing opportunities within the Arab League nations, including the proposed processing plant at Duqm Industrial City in Oman (Medallion Resources Ltd., 2013)

Sulfur.—Suhail Chemical Industries (SCI), which was a subsidiary of Suhail Bahwan Group, produced sulfuric acid at its plant in the Sohar Industrial Estate. SCI had the capacity to produce 1.46 Mt/yr of sulfuric acid. The plant was the only fully dedicated plant for sulfuric acid production in the country. Sulfuric acid output was used to supply the local market for electrolyte battery acid, alkalinity correction in reverse osmosis plants, and other uses. Sulfur from the plant was also exported to African and GCC countries, as well as Sri Lanka and Yemen. SSF, which was as a joint venture of Takamul (the majority shareholder) and CoreSulphur Inc. of the United States, manufactured sulfur bentonite fertilizer and other micronutrients in Oman. SSF had the capacity to produce 30,000 t/yr of sulfur bentonite fertilizer at its plant, which was located in the Sohar Industrial Estate. SSF had an agreement with ORPIC whereby ORPIC supplied 30,000 t/yr of sulfur to SSF (Suhail Bahwan Group, 2014; Takamul Investment Co. S.A.O.C, 2014).

Mineral Fuels

Natural Gas and Petroleum.—Petroleum production had been increasing steadily in the past 5 years in Oman. Much of the increase was attributed to the use of comprehensive enhanced oil recovery (EOR) methods for mature oilfields. EOR techniques, which included miscible gas injection, polymer fluids injection, and steam injection, were chosen on a field-by-field basis. In 2013, the main producers of crude oil and condensate in Oman were PDO, which had an average production of 655,600 barrels per day (bbl/d); Occidental Petroleum Corp. of the United States, which produced 213,200 bbl/d; and DNO International ASA of Norway, which produced 12,800 bbl/d. Other minor producers included BP Oman (a subsidiary of BP p.l.c. of the United Kingdom), CC Energy Development S.A.L., Daleel Petroleum Co. L.L.C., Petrogas E & P L.L.C., and PTT Exploration and Production Public Company Ltd. of Thailand (Ministry of Oil and Gas, 2014; Petroleum Development Oman, 2014, p. 15, 20).

In 2013, ORPIC had the capacity to produce 222,000 bbl/d of refined petroleum products from the country's two refineries, which were located in Sohar and Mina Al-Fahl. ORPIC planned to increase the refinery capacity at Sohar to 200,000 bbl/d from 116,000 bbl/d by 2016 at a cost of $2 billion. The Government also planned to build a third refinery at Duqm in southern Oman. The new refinery would be located in the Special Economic Zone at Duqm and would have the capacity to produce 230,000 bbl/d and to store up to 200 million barrels of crude oil. The project would be a joint venture of the Government and international investors, and most of the output of the refinery products would be destined for export (U.S. Energy Information Administration, 2013).

Outlook

Oman's non-oil economy is expected to grow by 5.4% in 2014 and 2015. The growth rate is attributed to Government spending on non-oil-related projects to achieve the country's economic diversification goals. The mineral industry of Oman is expected to continue to grow in the next 5 years as local, regional, and international companies continue to invest in primary and secondary aluminum, cement, ferrochrome, gypsum, iron and steel, lime, nitrogen, and petrochemical projects in the country. Much of the expected growth is driven by the increased demand for industrial minerals for infrastructure projects in Oman as well as in the neighboring countries of Qatar, which will be hosting the FIFA World Cup™ in 2022, and the UAE, which will be holding the World Expo in Dubai in 2020.

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TABLE 1
OMAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity		2009	2010	2011	2012	2013
METALS						
Aluminum		351	367	373	360	354
Chromium:						
Ore, gross weight		798	865	617	602 r	788
Metal content (35% chromic oxide)		279	303	216	211 r	276
Copper:						
Mine output, gross weight		82	87	111	104	57
Mine output, Cu content		2	2	2	2	1
Smelter output, Cu content		12 r,2	9 r	12 r	12 r	12
Refined, Cu content[e]		15	15	16	16	16
Gold, metal or Au content	kilograms	28	27	--	--	--
Iron and steel:						
Crude steel[e]		84	84	160	160	160
Direct-reduced iron		--	--	1,110	1,460	1,470
Laterite (iron oxides)		392	375	722	710 r	572
Iron ore, pellets[3]		--	--	--	9,000	9,000
Manganese:						
Gross weight	metric tons	--	--	41,300	37,500	49,000
Metal content (25% Mn)	do.			10,235	9,375	12,250
Silver, metal or Ag content	kilograms	15	10	--	--	--
INDUSTRIAL MINERALS						
Cement, hydraulic		4,000	4,500	5,000	4,569 r	4,472
Clay		148	156	170	195 r	222
Gypsum		254	653	1,254	1,915	2,785
Kaolin		9	47	143	140	115
Limestone		3,353	4,638	4,995	6,488 r	5,489
Marble		631	695	931	1,165 r	1,255
Methanol		2,000 r	2,000 r	2,000 r	2,100 r	2,150
Nitrogen:[e]						
N content of ammonia		1,000	1,100 r	1,100 r	1,100 r	1,100
N content of urea		830	1,000 r	1,000 r	1,000 r	1,000
Quartz		209	187	217	623 r	347
Salt		31	12	12	13	12
Sand and gravel		69,251	70,686	69,391	72,990 r	69,449
Silica sand		32	34	38	47	47
Sulfur:						
Elemental		50	50	36	59	51
Sulfuric acid		1,200	1,200	1,200	1,400	1,400
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	31,022	33,259	34,721 r	35,942 r	37,149
Dry	do.	25,140	27,086	28,595 r	29,606 r	30,294
Liquefied[4]	thousand metric tons	8,740	9,000	8,890	8,620	9,200
Natural gas liquids	thousand 42-gallon barrels	296,563 r	315,579 r	322,988 r	335,216 r	343,830
Petroleum:						
Crude and condensate	do.	296,600	315,575	325,215	335,070 r	343,830
Refinery products:						
Liquefied petroleum gas	do.	5,232 r	4,501 r	3,448 r	3,276 r	2,496
Gasoline	do.	18,396	16,242	23,250	23,324	21,737
Jet fuel and kerosene	do.	5,840	4,599	4,891	5,544 r	4,393
Distillate fuel oil	do.	13,396	11,132	15,804	15,476	14,108
Residual fuel oil	do.	5,804	2,263	3,342 r	3,242 r	2,084
Other	do.	26,372 r	21,063 r	26,375 r	25,258 r	24,842
Total	do.	75,040	59,800	77,110	76,120	69,660

See footnotes at end of table.

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TABLE 1—Continued
OMAN: PRODUCTION OF MINERAL COMMODITIES[1]

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. -- Zero.
[1]Table includes data available through February 9, 2015.
[2]Reported figure.
[3]Pellets were produced from imported iron ore for use by direct-reduction plants.
[4]Liquefied natural gas is produced by treating gross natural gas in treatment plants to remove water, carbon sulfide, hydrogen sulfide, and other components.

TABLE 2
OMAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum:			
Primary	Sohar Aluminium Co. L.L.C. [Oman Oil Co. S.A.O.C. (OOC), 40%; Abu Dhabi Energy Co. P.J.S.C., 40%; Rio Tinto Alcan, 20%]	Smelter at Sohar	360,000.
Secondary	Oman Aluminium Rolling Co. (OARC) (Takamul Investment Co. S.A.O.C.)	Sohar Industrial Estate	140,000.
Do.	Oman Aluminum Processing Industries L.L.C. (OAPIL) (Oman Cables Industries S.A.O.C., 51%, and Takamul Investment Co. S.A.O.C., 49%)	Muscat	60,000.
Calcium carbonate	Northern Minerals Co. L.L.C.	Ruwi	70,000.
Cement	Oman Cement Co. S.A.O.C. (Government, 51%; Pension funds, 33.65%; Individual investors, 9.85%; Public Authority of Social Insurance, 5.50%)	Kilns and mills at Rusayl	2,500,000.
Do.	Raysut Cement Co. S.A.O.C. (RCC)	Kilns and mills at Salalah	4,700,000.
Do.	Al Madinah Cement Co. L.L.C.	Kilns and mills at Wadi Saa	750,000.
Chromite:			
Ore	Al Tamman Trading Establishment L.L.C.	Al Ram Mine and Wadi Rajmi Mine	250,000.
Do.	Hatton FZE	Mines south of Muscat	200,000.
Do.	Gulf Mining and Materials Co.	Wadi Mahram Estate	200,000.
Do.	Oman Chromite Co. S.A.O.G. (Ministry of Commerce and Industry, 15%)	Mines near Sohar	200,000.
Do.	Northern Minerals Co. L.L.C.	Somail	20,000.
Do.	Sun National Minerals L.L.C. (Zawawi Minerals L.L.C., 80%)	Northern Oman	NA.
Concentrated	Gulf Mining and Materials Co.	Ad Dakhiliyah	50,000.
Ferrochrome	Al Tamman Indsil Ferro Chrome L.L.C.	Sohar Freezone	150,000.
Clays	NA	NA	300,000.
Copper:			
Ore, gross weight	Mawarid Mining L.L.C. (MB Holding Co. L.L.C., 100%)	Open pit mines at Ajib and Shinas	80,000.
Concentrated ore	do.	Lasail, near Sohar	40,000.
Refined metal	Oman Mining Co. L.L.C. (OMC) (Government, 100%)	Sohar Industrial Estate	20,000.
Gold:			
Ore kilograms	Mawarid Mining L.L.C. (MB Holding Co. L.L.C., 100%)	Open pit mines at Ajib and Shinas	100.
Refined do.	Oman Mining Co. L.L.C. (OMC) (Government, 100%)	Sohar Industrial Estate	500.
Gypsum	Cement Gypsum Products Co. S.A.O.G.	Buraimi and Thumrait	180,000.
Do.	Gulf Mining and Material Co.	Thamrait	200,000.
Do.	Global Mining Co., L.L.C.	Sohar	65,000.
Do.	Al-Rawas Mining Co. L.L.C. (Al-Rawas Holding L.L.C., 100%)	Salalah	2,000,000.
Do.	Zawawi Gypsum L.L.C. (Zawawi Minerals L.L.C., 45%; Boral Ltd., 27.5%; USG Corp., 27.5%)	Thamrait, Dhofar Governorate	3,000,000.

See footnotes at end of table.

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TABLE 2—Continued
OMAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Iron and steel:				
Iron ore pellets		Vale Oman Pelletizing Co. L.L.C. (VOPC) [Vale S.A., 70%, and Oman Oil Co. S.A.O.C. (OOC), 30%]	Thamrait, Dhofar Governorate	9,000,000.
Iron ore (laterite)		Gulf Mining and Materials Co.	Barka	300,000.
Crude steel		Jindal Shadeed Iron and Steel L.L.C. (Jindal Steel and Power Ltd., 100%)	Sohar	2,000,000.
Do.		Modern Steel Mills L.L.C. (Oman International Development and Industrial Co. S.A.O.G., Assarain Group of Companies, Dharamsey Group, and others)	Rusayl	160,000.
Direct-reduced iron		Jindal Shadeed Iron and Steel L.L.C. (Jindal Steel and Power Ltd., 100%)	Sohar	1,500,000.
Rolled-steel products (rebar)		Sharq Sohar Steel Rolling Mills L.L.C.	do.	250,000.
Do.		Hadid Majan L.L.C.	Bait Al Falaj	100,000.
Rolled-steel products (tubes)		Al Jazeera Tube Mills Co. S.A.O.G.	Sohar	300,000.
Galvanized steel products (wires)		Gulf Specialty Steel Industries L.L.C. (GSSI) (Global Steel Industries Pte Ltd. and Takamul Investment Co. S.A.O.C.)	do.	60,000.
Kaolin		NA	NA	150,000.
Limestone		Oman Cement Co. S.A.O.G. (Ministry of Commerce and Industry, 30.4%)	Rusayl	2,400,000.
Do.		Northern Minerals Co. L.L.C.	Wadi Al Jizzi, Al Batinah	900,000.
Do.		Global Mining Co., L.L.C.	Sohar	NA.
Manganese		Al Tamman Trading Establishment L.L.C.	Al Qabil	60,000.
Marble		do.	Buraimi	700,000.
Do.		Companies that quarried marble included Al Ajmi Marble Co., Al Madinah Marble Co., Al Nasser Marble Co., Al Rushaidi Marble Co., Al Shanfri Marble Co., Al Zarabi Marble Co., Gulf Mining Materials Co., International Marble, and Omani Marble Co.	Quarries located primarily in Ibri Wilayat and the Buraimi Estate	450,000.
Methanol		Salalah Methanol Co. LLC [Oman Oil Co. S.A.O.C. (OOC) 90%, and Takamul Investment Co., S.A.O.C., 10%]	Salalah Free Zone	1,050,000.
Do.		Oman Methanol Co. LLC (Oman Methanol Holding Co. LLC and Methanol Holding International Ltd.)	Sohar Port	1,050,000.
Natural gas	million cubic meters	Petroleum Development Oman L.L.C. (PDO) [Government, 60%; Royal Dutch Shell plc, 34%; Total S.A., 4%; Partex (Oman) Corp., 2%]	Associated natural gas in the Kauther/Yibal, the Saih Niyahda, and the Saih Rawl clusters	27,000.
Natural gas, liquefied		Oman Liquefied Natural Gas L.L.C. [Government, 51%; Shell Gas B.V., 30%; Total S.A., 5.54%; Korea LNG, 5%; Mitsubishi Corp., 2.77%; Mitsui E&P Middle East B.V., 2.77%; Partex (Oman) Corp., 2%; Itochu Corp., 0.92%]	Two trains at Qalhat	6,600,000.
Do.		Qalhat Liquefied Natural Gas S.A.O.C. (Government, 46.84%; Oman Liquefied Natural Gas L.L.C., 36.8%; Union Fenosa S.A., 7.36%; Mistubishi Corp., 3%; Oskas Gas Co. Ltd., 3%; Itochu Corp., 3%)	One train at Qalhat	3,300,000.
Nitrogen fertilizer	thousand metric tons	Oman India Fertiliser Co. S.A.O.G. (OMIFCO) [Oman Oil Co. S.A.O.C. (OOC), 50%; Indian Farmers Fertiliser Cooperative Ltd., 25%; Krishak Bharati Cooperative Ltd., 25%]	Sur	923 ammonia, 1,652 urea.
Do.	do.	Sohar International Urea & Chemical Industries S.A.O.G. (SIUCI) (Suhail Bahwan Group, 100%)	Sohar	1,300 urea.

See footnotes at end of table.

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TABLE 2—Continued
OMAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum:				
Crude	barrels per day	Petroleum Development Oman L.L.C. (PDO) [Government, 60%; Royal Dutch Shell plc, 34%; Total S.A., 4%; Partex (Oman) Corp., 2%]	About 100 oilfields in the Bahja, Fahud, Harweel, Lekhwair, Marmul, Nimr, Qarn Alam, and Yibal clusters	655.
Do.	do.	Oxy Oman, Inc (Occidental Petroleum Corp., 65%, and Mitsui E&P Middle East B.V., 35%)	Blocks 9 and 27, includes the Safah and Al Sunienah fields	90,400.
Do.	do.	Daleel Petroleum Co. L.L.C. (Mazoon Petrogas S.A.O.C., 50%, and Mazoon Petrogas B.V.I., 50%)	Block 5, includes the Bushra, Daleel, Mezoon and Shadi fields	40,400.
Do.	do.	Occidental Mukhaizna, L.L.C. [Occidental Petroleum Corp., 45%; Oman Oil Co. S.A.O.C. (OOC), 20%; Shell Oman Trading Co. Ltd., 17%; Liwa Energy Ltd., 15%; Total Exploration and Production Oman, 2%; Partex (Oman) Corp., 1%]	Block 53, Mukhaizna field	122,800.
Do.	do.	Joint venture of DNO International ASA, 50%, and LG International Corp., 50%	Block 8, Bukha field	12,800.
Do.	do.	CC Energy Development S.A.L.	Saiwan and Farha fields	15,100.
Do.	do.	Petrogas E & P L.L.C., 50%; Tethys Oil, 30%; Mitsui E&P Middle East B.V., 20%	Rija, Ramlat, and Sahmah fields (Block 7)	1,100.
Do.	do.	PTT Exploration and Production Public Company Ltd.	Block 44	3,400.
Do.	do.	BP Oman [BP p.l.c., 60%, and Oman Oil Co. S.A.O.C. (OOC), 40%]	Khazzan and Makarem gasfields (Block 61)	300.
Refined	do.	Oman Oil Refineries and Petroleum Industries Co. (ORPIC) (Ministry of Finance, 75%, and Oman Oil Co. S.A.O.C., 25%)	Refinery at Sohar	116.
Do.	do.	do.	Refinery at Mina Al-Fahal	106.
Quartz		Gulf Stone Co. S.A.O.G.	Sohar	650,000.
Salt, crude, industrial		Modern Salt Co. L.L.C.	Ibri Wilayat	12,000.
Sand and gravel		NA	NA	70,000,000.
Silica sand		Industrial Minerals Co. LLC (Northern Minerals Co. L.L.C., 100%)	NA	50,000.
Silver	kilograms	Oman Mining Co. L.L.C.	Sohar and Yankul	50.
Sulfur:				
Elemental	thousand metric tons	Oman Oil Refineries and Petroleum Industries Co. (ORPIC) (Ministry of Finance, 75%, and Oman Oil Co. S.A.O.C., 25%)	Refinery at Sohar	50.
Fertlizer	do.	Sohar Sulphur Fertilizers L.L.C. (SSF) (Takamul Investment Co. S.A.O.C., 69%)	Sohar Industrial Estate	30.
Sulfuric acid	do.	Sohar Chemical Industries (SCI) (Suhail Bahwan Group)	do.	1,460.

Do., do. Ditto. NA Not available.

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The Mineral Industry of Qatar

By Waseem A. Abdulameer

In 2013, Qatar continued to play a significant role in the global mineral commodities sector, primarily as the world's leading exporter of liquefied natural gas (LNG), as a major crude oil producer, and as the world's third-ranked helium producer. In terms of world output, Qatar produced moderate amounts of aluminum, ammonia, direct-reduced iron (DRI), and urea. Qatar's earnings from its hydrocarbon sector, which accounted for about one-half of its gross domestic product (GDP), accounted for about 60% of the country's total Government revenues in 2013 (Qatar Ministry of Development Planning and Statistics, 2013, p. 5). Qatar accounted for 2% of the world's crude oil production in 2013, and ranked fourth globally in natural gas production, accounting for about 4.6% of the world's total (International Energy Agency, 2014, p. 13; U.S. Energy Information Administration, 2014). Qatar had the third-largest proved natural gas reserves in the world, which were estimated to be 25.04 trillion cubic meters in 2013. Qatar was also one of the major gas-to-liquids (GTL) producers, and produced other mineral commodities, such as cement, lime, methanol, and sulfur, by yearend 2013 (table 1; Apodaca, 2014; BP p.l.c., 2014, p. 6, 8, 20, 22; International Monetary Fund, 2014, p. 4; Qatar National Bank S.A.Q., 2014, p. 3, 12).

Minerals in the National Economy

Qatar's real GDP increased by 6.0% in 2013 compared with an increase of 6.2% in 2012. The hydrocarbon sector accounted for one-half of the value of Qatar's economy in 2013. Qatar was among the most competitive countries in the global natural gas market, accounting for about one-third of the global LNG trade in 2013, and it was a key supplier to India, Japan, the Republic of Korea, and the United Kingdom. Qatar's gas production increased moderately in 2013 both to meet the increasing domestic demand for electricity generation, and to produce GTL and petrochemicals. As part of the national development strategy for 2011 to 2016 that was adopted in 2008 to help sustain and diversify the country's economic growth, the Government carried out a new array of projects that focused on construction, crude oil, petrochemicals, and transport in 2013. Those projects included Al Sejeel petrochemical, the Doha Port, the Qatar Integrated Rail, and the Hamad International Airport projects and were part of an effort to develop and strengthen the country's infrastructure (International Monetary Fund, 2014, p. 4, 6; Qatar National Bank S.A.Q., 2014, p. 1, 11, 16; World Bank, The, 2014a, p. 3, 40).

Government Policies and Programs

The Government in Qatar had embraced new plans by the mid-2000s that were focused on maintaining growth and responding flexibly to global economic fluctuations (Office of the United States Trade Representative, 2014). The Qatar National Vision (QNV 2030) set long-term economic transformation goals aimed at diversifying the economy and creating more job opportunities while maintaining transparent and practical investment policies. The vision's core objective is to transform Qatar into a diversified economy by 2030. The Qatar Organization of Foreign Capital Investment Law No. (13) of 2000 permits foreign investors to own up to 100% of projects that involve the production of natural (including mineral) resources and energy and development of the mining sector, contingent upon the Government's approval (Qatar Central Bank, 2014). The moratorium on new projects in Qatar's North Field, which was declared in 2005 and took effect in 2012, was projected to continue until 2015; the ongoing moratorium was expected to result in slower growth in production in the next 2 years (U.S. Department of State, 2014, p. 1–2).

According to the International Monetary Fund, Qatar embarked on a diversification strategy through budget-financed investment projects that were to help support private sector development and sustain the macroeconomic policy framework (International Monetary Fund, 2014, p. 2–3; U.S. Energy Information Administration, 2014; World Trade Organization, 2014, p. 4, 8, 15).

Production

Qatar's mineral production had only a few notable changes in 2013 compared with that of 2012. Most significantly, helium production increased by 39% compared with that of 2012. Increases were also recorded in the production of such minerals as urea, by 21% and ammonia, by 13%. Production of aluminum, methanol, dry natural gas, and crude oil and condensate increased slightly. Cement production decreased by 3%, and DRI production decreased by 1% (table 1).

Structure of the Mineral Industry

Qatar Petroleum (QP), which was a state-owned public corporation, was established by Emiri Decree No. 10 in 1974. QP owned and operated all exploration, refinery, and production facilities in the State of Qatar (Qatar Petroleum, 2014b, p. 18). Through its subsidiaries, QP controlled all aspects of Qatar's upstream and downstream crude oil and natural gas sector, including the exploration, production, transport, storage, marketing, and sale of crude oil, GTL, LNG, natural gas liquids (NGLs), fertilizers, and petrochemicals. Qatargas Co. operated four primary LNG enterprises at Ras Laffan (Qatar Petroleum, 2014a).

In 2013, Industries Qatar Q.S.C. (IQ), which was a state-owned company, owned 80% of Qatar Petrochemical Co. Ltd. Q.S.C. (QAPCO), and 50% of Qatar Fuel Additives Co. Ltd. Q.S.C. (QAFAC), which produced mainly methanol, petrochemicals, and sulfur. IQ also owned 75% of Qatar Fertilizer Co. S.A.Q. (QAFCO), which produced primarily ammonia, urea, and

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urea formaldehyde condensate (UFC–85). Qatar Steel Co. Q.S.C. (QASCO) produced hot-briquetted iron (HBI) and DRI, steel-reinforcing bar (rebar), steel billets, and steel coils, in addition to lime (Industries Qatar Q.S.C., 2014, p. 10, 12, 14; U.S. Energy Information Administration, 2014).

Mineral Trade

According to the Organization of the Petroleum Exporting Countries (OPEC), Qatar's petroleum exports were valued at $6.25 billion, or nearly one-half of the country's $13.64 billion worth of total exports in 2013 (Organization of the Petroleum Exporting Countries, 2014a). Qatar's petroleum exports increased by about 10% in 2013 compared with that of 2012, and went primarily to countries in the Asia and the Pacific region. Qatar's exports of natural gas increased by about 6% from the previous year. Qatar continued to export most of its petroleum products to the Asia and the Pacific region, mainly Japan, which accounted for about 29% of Qatar's total hydrocarbon exports, followed by the Republic of Korea, 17%; India, 10%; and China, 8% (Perumal, 2014).

In September 2013, Qatar Customs Authority introduced a new Government online portal for exports and imports, which was called Al Nadeeb. The Web-based system would allow transactions to be conducted electronically for different customs and declaration operations, such as registration, inspection, tracking, and electronic payment. The system, which would be connected to 17 other agencies in the e-Government System, was expected to increase Qatar's customs efficiency by reducing the processing time for import and export operations, and permitting electronic filing of declaration forms to the authorities (Said, 2014, p. 32–33; World Bank, The, 2014b, p. 64–65).

According to the Qatar Ministry of Development Planning and Statistics, the year-on-year increase of 3% in exports was attributed to an increase in the quantity of exports of mineral fuels, lubricants, and related material exports. Ammonia exports increased by 24%, and those of other chemicals, by 11%, whereas iron and steel exports decreased by 18%, and nonferrous metal exports, by about 1%. Mineral or chemical fertilizer exports increased by 5%, and exports of petroleum oils (other than crude) increased by 8% (Qatar Ministry of Development Planning and Statistics, 2014, p. 4–5).

In 2013, Qatar imports increased in value by 7% compared with those of 2012. This increase was owing mainly to a 12% increase in machinery and transport equipment imports, a 14% increase in chemicals and related products imports, and a 9% increase in manufactured articles imports. Organic chemicals exports increased by 25%, whereas those of inorganic chemicals decreased by 30%. Iron ore and concentrates exports increased by 20% (Qatar Ministry of Development Planning and Statistics, 2014, p. 3–7).

In 2013, Japan continued to be the major destination for Qatar's exports, whereas the United States was Qatar's leading goods supplier (World Bank, The, 2014a, p. 40, 49). The U.S. trade surplus with Qatar was $3.6 billion in 2013, which was a 41% increase compared with that of 2012. Qatar was the 45th-ranked goods exports market for the United States in 2013. U.S. imports from Qatar were valued at $1.4 billion in 2013, which was a 33% increase compared with that of 2012. Qatar exported mainly mineral fuels (LNG), fertilizers, aluminum, and organic chemicals to the United States, and imported aircraft, vehicles, machinery, and precious stones from the United States (Office of the United States Trade Representative, 2014).

Commodity Review

Metals

Aluminum.—In 2013, Qatar Aluminium Ltd. (QATALUM), which was a 50–50 joint venture between QP and Norsk Hydro ASA of Norway, registered a slight increase in its production compared with that of 2012. The company produced 634,000 metric tons (t) of aluminum in 2013 compared with 627,971 t in 2012. The company imported its raw materials from Australia and Brazil. Despite the increase in production, sales revenue decreased owing to a decline in the price of aluminum. The company's local sales increased significantly by about 90%, however, owing to initiatives put in place by the Govenment to sustain local development of the downstream aluminum industry. Compared with those of 2012, Qatalum's total greenhouse gas emissions decreased by 20% in 2013 owing to the inauguration of an onsite power generation plant (Qatar Aluminium Ltd., 2014, p. 26, 29, 42; Aluminum Middle East, 2015).

Iron and Steel.—QASCO was the major iron and steel production company in Qatar. QASCO's production of DRI decreased modestly to 2.39 million metric tons (Mt) in 2013, from 2.42 Mt in 2012, whereas crude steel output increased to 2.2 Mt from 2.1 Mt in 2012. In 2013, QASCO's imports of iron ore decreased to 2.43 Mt from 2.71 Mt in 2012. In 2013, the company supplied nearly 97% of the local demand for rebar and met about 16% of the Gulf Cooperation Council's (GCC's) market needs. In 2013, QASCO started to supply customized rebar that was of a special length and high strength. Planned and unplanned shutdowns caused by both maintenance work and expansion operations affected the continuity of production at the QASCO plant, which led to an overall decrease in annual production. In 2013, QASCO continued work on its $1.2 billion greenfield steel-melt shop, which was coded as EF 5. The melt shop, which was located near the company's main facility in the Mesaieed Industrial City, would increase the company's billet capacity by an additional 1.1 Mt/yr when the new melt shop opens in the beginning of 2014 (Peninsula, The, 2014; Qatar Steel Q.S.C., 2014, p. 8, 18, 22; World Steel Association, 2014, p. 2, 97, 105).

Industrial Minerals

Cement, Lime, and Limestone.—Qatar's cement production capacity increased to about 6.2 million metric tons per year (Mt/yr) in 2013, which was almost sufficient to meet the local market demand. Qatar National Cement Co. (QNCC) accounted for nearly 70% of cement production in Qatar in 2013; it produced about 3.4 Mt of clinker, which was a slight decrease from the previous year's production of 3.6 Mt/yr (Qatar National Cement Company Q.S.C., 2014, p. 5). Al Khalij

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Cement Co. (a subsidiary of Qatari Investors Group) accounted for about 20% of the cement production in the country. Al Khalij Cement Co. produced 1,935 Mt of clinker in 2013, which was a 43% increase from that of 2012 (Qatari Investors Group, 2014, p. 23).

QNCC was exploring the possibilities for a new program to minimize the decline in lime production and sales. QNCC lime production, both calcined and hydrated, remained steady in 2013 at 14,400 t. QASCO planned to stop purchasing limestone from QNCC beginning in 2013 because QASCO was producing calcined limestone from its own plant, which had two kilns that each had the capacity to produce 275 metric tons per day of limestone (Qatar Steel Q.S.C., 2014, p. 8, 27; FMW Co., 2015).

QNCC was pursuing efforts to increase its cement production to respond to the projected expansion in the domestic construction market. The expected growth in Qatar's construction sector was based on the planned implementation of the QNV 2030 development plan, which was expected to double the domestic demand for cement in the next 3 years (Gibbon, 2014). In response to the projected growth, QNCC signed an agreement with FLSmidth of Denmark in 2013 to construct a new cement production line, which was expected to commence operations in 2015. The new line was projected to increase QNCC's capacity by 0.93 Mt/yr (Global Cement, 2013; Why Qatar Magazine, 2014).

Nitrogen.—In 2013, Qatar was the world's fourth-ranked urea producer. QAFCO was the sole producer of ammonia and urea in the country. QAFCO produced 3.6 Mt of ammonia from six ammonia production units in Mesaieed that had a combined capacity of 3.8 Mt, and produced 5.5 Mt of urea from six urea production units that had a combined capacity of 5.6 Mt. QAFCO consumed a notable portion of its ammonia to produce urea. QAFCO's urea exports represented 15% of the world trade, and its export markets included North America, Southeast Asia, Australia, and South Africa (table 2; Qatar Fertilizer Co. Q.S.C., 2014, p. 19).

Mineral Fuels and Related Materials

Helium.—Qatar was expected to become the world's second-ranked helium producer behind the United States in late 2013. RasGas, which was the major LNG producer in Qatar, commenced its second helium production plant, Qatar Helium 2, in June, and reached a capacity of 36 million cubic meters per year in October. The new production plant was expected to join Helium 1, which had a capacity of 20 million cubic meters per year to produce a total amount of 56 million cubic meters per year, and eventually to meet 25% of the annual global helium demand. RasGas invested in Qatar's North Field, which holds about 26% of the world's helium reserves. The global demand for helium increased by about 20% in the past decade. This demand was expected to increase by about 2% to 3% annually through 2030 (RasGas Company Ltd., 2013, 2014).

Natural Gas.—In 2013, Qatar's total natural gas production increased steadily. According to Qatar National Bank (QNB), at the current extraction rate, Qatar was projected to continue supplying the world natural gas market into the next century. Qatar produced about 184 million cubic meters of gross natural gas in 2013 compared with about 163 million cubic meters in 2012. The country produced about 158 million cubic meters of dry gas in 2013, which was slightly higher than that of 2012. About 52% of the Qatari natural gas production went toward LNG exports. In 2013, Qatargas produced 41 million cubic meters of LNG from its four operational lines: Qatargas 1, Qatargas 2, Qatargas 3, and Qatargas 4. Asia received about 65% of Qatargas LNG exports in 2013, whereas Europe received 23%, leaving the United States and the Middle East at 6% each. Qatargas signed three 5-year agreements in 2013 to supply LNG to three different consumers starting in 2014. The first agreement was with E.ON SE of Germany, to which Qatargas would supply 1.5 million cubic meters of LNG annually. The second agreement was signed with PETRONAS LNG Ltd. of the United Kingdom, to which Qatargas would supply 1.1 million cubic meters per year of LNG. The third agreement was signed with Centrica p.l.c. of the United Kingdom, to which Qatargas would supply 1.5 million cubic meters per year of LNG (Qatargas Company Ltd., 2014, p. 11, 31–32). RasGas, which produced about 92 million cubic meters of LNG in 2013, operated Al Khaleej Gas Project (AKG) and used the North Field to supply about 48 million cubic meters of gas to domestic beneficiaries.

The Barzan Gas development project, which was a $10.3 billion LNG investment project, was considered to be a crucial segment of the QNV 2030 strategy. QP, through its subsidiary Qatargas, held 93% of the joint venture with Exxon Mobil Corp. of the United States, which held the remainder of the stake through its subsidiary ExxonMobil Barzan. Upon completion in the next 2 years, the joint venture planned to appoint RasGas as the manager and the operator of the development project. The LNG Train 1 was expected to come onstream in late 2014, and LNG Train 2 was to follow in 2015; the Barzan gas plant would receive raw gas from a drilling platform that was located in Ras Laffan Industrial City about 80 kilometers inland. The project was projected to have the capacity to produce 39.62 million cubic meters per day of natural gas through processing the associated natural gas from the North Field, and then to supply natural gas to power stations and local ethane and petrochemical industries in Qatar by the end of 2014. RasGas continued to work on the LNG Train 1 phase of the project in 2013 to increase natural gas supplies to the domestic market. The objective of the project was to satisfy the country's consistent need for energy and to support the Government's efforts to expand the country's infrastructure and diversify the economy (Qatar National Bank S.A.Q., 2014, p. 6, 16, 20; Qatar Petroleum, 2014b, p. 18, 39–40, 48–49, 55–56).

Petroleum.—The volume of QP's crude oil, condensate, and NGL production increased slightly in 2013 compared with that of 2012. The country's total crude oil, condensate, and NGL production was about 2.0 million barrels per day (Mbbl/d) in 2013, of which 0.7 Mbbl/d was crude oil and the remainder was condensate and NGL. According to OPEC's latest statistics (in 2014), Qatar produced an average of 723,900 barrels per day (bbl/d) of crude oil in 2013, which was a slight decrease from the 733,600 bbl/d produced in 2012 (Organization of the Petroleum Exporting Countries, 2014b, p. 28). Oil exploration activity in Qatar continued, led by QP, although at a slower

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pace than exploration in other GCC countries. Three fields—Al Shaheen, the Dukhan, and the Idd Al-Shargi fields—accounted for more than 85% of the country's crude oil production capacity. The main crude streams in the country consisted of the Qatar Land, the Qatar Marine, and Al Shaheen. The Qatar Land and the Qatar Marine were both lighter crudes, whereas the Al Shaheen was slightly heavier. The Qatar Marine and Al Shaheen streams contained a higher sulfur percentage than the Qatar Land stream did (U.S. Energy Information Administration, 2014). Dukhan field, which was one of the largest oil and gas fields in Qatar, had about 323 oil-producing wells that QP used to produce and export crude oil through the Mesaieed terminal. The Dukhan field supplied condensates and NGL to the Mesaieed refinery. QP operated two offshore production stations—PS–2 and PS–3; both platforms produced crude oil, condensate, and natural gas (Qatar Petroleum, 2014b, p. 43, 46).

Refined Petroleum Products.—In 2013, QP operated the first phase of the Laffan refinery, which produced 38,000 bbl/d of gasoline, 21,600 bbl/d of kerosene, and 3,500 bbl/d of LPG. QP was expected to start the second phase of the Laffan refinery, which was expected to produce an additional 146,000 bbl/d of refined products, near the end of 2016. In 2013, QP and Royal Dutch Shell plc of the Netherlands operated Pearl 1 and Pearl 2, which were phases of the Pearl GTL plant project. The development of the $19 billion project was completely funded by Royal Dutch Shell. The Pearl GTL plant had one of the largest natural-gas-processing trains in the world. In 2013, the plant produced 18.8 million barrels (Mbbl) of condensate and 36.5 Mbbl of GTL products, which was an increase of 22.8% and 27.6%, respectively, compared with that of 2012 (True, 2013; Qatar Petroleum, 2014b, p. 68–70, 73; Shell Global, 2014).

Outlook

A comprehensive look at the future of mineral industry and production trends in Qatar has to take into consideration the expected effect of implementing the national development plan and the economic diversification policy. The Government is set to concentrate on encouraging investments in the infrastructure, manufacturing, and transportation sectors to meet its objectives. This strategy would provide the framework to achieve short-term and long-term infrastructure-reinforcing projects in preparation for the 2022 FIFA World Cup tournament in Qatar. The development trend in the oil and natural gas sectors is likely to continue plateauing until the end of 2015, when the Barzan gas project is scheduled to reach its full capacity. The key driver of economic growth is expected to continue to be the non-oil industrial sector, as the domestic demand for such construction materials as cement and steel is projected to see a major boost within the next few years. An acceleration in the country's internal energy demand is likely to be a reflection of the increasing need of the infrastructure projects for manufactured minerals.

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TABLE 1

QATAR: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
METALS						
Aluminum		10	126	487 r	628 r	634
Iron and steel:						
Direct-reduced iron		2,096	2,157	2,230	2,420	2,386
Semimanufactures:						
Billet, cast		1,448	1,946	2,005	2,105	2,205
Bars, rolled		1,468	1,650	1,819	1,910	2,000
Steel, crude		1,566	1,705	2,000	2,100	2,236
INDUSTRIAL MINERALS						
Calcium carbonate		--	--	--	75	17
Cement, all types		4,100	4,000	5,000	5,500	5,335
Gypsum e		135	135	135	145	145
Lime		55	95	100	110	120
Nitrogen fertilizer:						
N content of ammonia		1,828	1,883	1,919	2,665	2,985
N content of urea		1,380	1,384	1,480	2,095	2,535
Sand, washed		7,500	7,600	6,000	4,100 r	4,700
Stone, limestone e		2,220	1,674 3	2,000	2,200	2,200
Sulfur		658	850	850	820	820
Sulfuric acid e		10	10	10	10	10
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	102,800	136,251	150,016	163,025	183,698
Dry	do.	89,300	131,165	145,271	157,050	158,500
Helium e	do.	20	20	20	20	38
Methanol		1,042	879	1,022	983	1,000
Natural gas liquids	thousand 42-gallon barrels	80,300	80,300	85,000	81,375	81,375
Petroleum:						
Crude and condensates	do.	490,925	572,685	670,140	717,590	728,175
Refinery products:						
Liquefied petroleum gas	do.	70,482	112,092	118,552	118,552	130,500
Gasoline	do.	13,930	16,291	15,878	15,500	13,870
Kerosene and jet fuel	do.	10,900	8,979	8,405	8,405	7,884
Distillate fuel oil	do.	11,607	10,038	10,000	11,660	8,139
Residual fuel oil	do.	1,533	1,752	1,350	1,378	2,299
Other	do.	17,848	11,534	10,585	7,811	9,198
Total	do.	126,300	160,686	164,770	163,306	171,889

eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. rRevised. do. Ditto. -- Zero.

[1]Table includes data available through November 26, 2014.

[2]In addition to the commodities listed, clays, dolomite, sand and gravel, and shale are produced; however, available information is inadequate to make reliable estimates of output.

[3]Reported.

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TABLE 2
QATAR: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum		Qatar Aluminium Ltd. (QATALUM) [Qatar Petroleum (QP), 50%, and Norsk Hydro ASA, 50%]	Smelter at Mesaieed	625
Cement:				
Portland		Qatar National Cement Co. (QNCC) (Government, 43%, and private Qatari investors, 57%)	4 kilns and 4 mills at Umm Bab	4,400
Do.		Al-Jabor Cement Industries Co. (Al Jabor Holdings, 75%, and Holcim Group, 25%)	2 clinker grinding mills at Mesaieed	900
White		Qatari Saudi Company for Industrial Transformation	do.	165
Calcium carbonate		Qatar National Cement Co. (QNCC) (Government, 43%, and private Qatari investors, 57%)	Umm Bab, 82 kilometers west of Doha	75
Gypsum		Qatari Saudi Company for Gypsum [Qatar Industrial Manufacturing Co., 33.375%; Qatar National Cement Co. (QNCC), 33.250%; National Gypsum Co., 33.375%]	Salwa Industrial Area	135
Helium	million cubic meters	Joint venture of Qatar Liquefied Gas Co. Ltd. 1 (Qatargas 1), Ras Laffan Liquefied Natural Gas Co. Ltd. (RasGas), and Ras Laffan Liquefied Natural Gas Co. Ltd. (II) (RasGas II)	Ras Laffan	56
Iron and steel:				
Iron, direct reduced		Qatar Steel Co. Q.S.C. [Industries Qatar Q.S.C. (IQ), 100%]	Mesaieed	2,400
Steel, crude		do.	Plant at Mesaieed	2,200
Steel, rolled		do.	Rolling mill at Mesaieed	1,440
Lime		Qatar National Cement Co. (QNCC) (Government, 43%, and private Qatari investors, 57%)	Kilns at Umm Bab	15
Do.		Qatar Steel Co. Q.S.C. [Industries Qatar Q.S.C. (IQ), 100%]	Mesaieed	200
Limestone		do.	Umm Bab	75
Methanol		Qatar Fuel Additives Co. Ltd. Q.S.C. (QAFAC) (Industries Qatar Q.S.C., 50%; OPIC Netherlands Antilles N.V., 20%; Lee Chang Yung Chemical Industry Corp., 15%; International Octane Ltd., 15%)	Mesaieed	1,000
Natural gas:				
Extracted	billion cubic meters	Qatar Petroleum (QP) (Government, 100%)	Al Khaleej field	8
Do.	do.	do.	North field	20
Do.	do.	do.	North field Alpha	10
Liquefied		Qatar Liquefied Gas Co. Ltd. 1 (Qatargas 1) [Qatar Petroleum (QP), 65%; Total S.A., 10%; ExxonMobil Qatar Inc., 10%; Mitsui & Co., Ltd., 7.5%; Marubeni Corp., 7.5%]	Three trains at Ras Laffan	10,200
Do.		Qatar Liquefied Gas Co. Ltd. 2 (Qatargas 2) [Qatar Petroleum (QP), 70%, and ExxonMobil Qatar Inc., 30%]	Train 4 at Ras Laffan	7,800
Do.		Qatar Liquefied Gas Co. Ltd. 2 (Qatargas 2) [Qatar Petroleum (QP), 65%; ExxonMobil Qatar Inc., 18.3%; Total S.A., 16.7%]	Train 5 at Ras Laffan	7,800
Do.		Qatar Liquefied Gas Co. Ltd. 3 (Qatargas 3) [Qatar Petroleum (QP), 68.5%; ConocoPhillips Co., 30%; Mitsui & Co. Ltd., 1.5%]	Train 6 at Ras Laffan	7,800
Do.		Qatar Petroleum Qatar Gas (4) Co. Ltd. (Qatargas 4) [Qatar Petroleum (QP), 70%, and Royal Dutch Shell plc, 30%]	Train 7 at Ras Laffan	7,800
Do.		Ras Laffan Liquefied Natural Gas Co. Ltd. (RasGas) [Qatar Petroleum (QP), 63%; ExxonMobil Qatar Inc., 25%; Korea Gas Corp., 5%; Itochu Corp., 4%; LNG Japan Corp., 3%)	Trains 1 and 2 at Ras Laffan	6,600
Do.		Ras Laffan Liquefied Natural Gas Co. Ltd. 2 (RasGas 2) [Qatar Petroleum (QP), 70%, and ExxonMobil Qatar Inc., 30%]	Trains 3, 4, and 5 at Ras Laffan	14,300
Do.		Ras Laffan Liquefied Natural Gas Co. Ltd. 3 (RasGas 3) [Qatar Petroleum (QP), 70%, and ExxonMobil Qatar Inc., 30%]	Trains 6 and 7 at Ras Laffan	15,600
Nitrogen:				
Ammonia		Qatar Fertilizer Co. S.A.Q. (QAFCO) [Industries Qatar Q.S.C. (IQ), 75%, and Yara Netherland BV, 25%]	QAFCO 1, Mesaieed	900
Do.		do.	QAFCO 2, Mesaieed	900
Do.		do.	QAFCO 3, Mesaieed	1,500

See footnotes at end of table.

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TABLE 2—Continued
QATAR: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Nitrogen—Continued:				
Ammonia—Continued		Qatar Fertilizer Co. S.A.Q. (QAFCO) [Industries Qatar Q.S.C. (IQ), 75%, and Yara Netherland BV, 25%]	QAFCO 4, Mesaieed	2,000
Do.		do.	QAFCO 5, Mesaieed	2,000
Do.		do.	QAFCO 6, Mesaieed	2,000
Urea		do.	QAFCO 1, Mesaieed	1,000
Do.		do.	QAFCO 2, Mesaieed	1,000
Do.		do.	QAFCO 3, Mesaieed	2,000
Do.		do.	QAFCO 4, Mesaieed	3,200
Do.		do.	QAFCO 5, Mesaieed	3,850
Do.		do.	QAFCO 6, Mesaieed	3,850
Petroleum:				
Crude	42-gallon barrels per day	Maersk Oil Qatar A.S., operator[1]	Al Shaheen field, offshore	330,000
Do.	do.	Qatar Petroleum (QP) (Government, 100%)	Dukhan field, onshore	256,000
Do.	do.	do.	Bul Hanine field, offshore	37,000
Do.	do.	Occidental Petroleum Corp., operator[1]	Idd Al Shargi, North Dome and South Dome, offshore	113,000
Do.	do.	do.	Al Rayyan, offshore	8,600
Do.	do.	United Petroleum Development Co. Ltd. (Bunduq Oil Production Co. Ltd, 97%, and BP p.l.c., 3%)	El Bunduq[2]	7,300
Do.	do.	Total E&P Qatar Ltd., operator[1]	Al Khaleej, offshore	37,500
Do.	do.	do.	Maydan Mahzam field, offshore	36,000
Do.	do.	Qatar Petroleum Development Co. operator[1] (Cosmo Oil Co., Nissho Iwai Corp., United Petroleum Development Co.)	Al Karkara and A Structure	6,200
Refined	do.	Qatar Petroleum Refinery [Qatar Petroleum (QP), 100%]	Umm Said	200,000
Do.	do.	The Laffan Refinery Co. Ltd. [Qatar Petroleum (QP), 51%; Cosmo Oil Co., 10%; Exxon Mobil Corp., 10%; Idemitsu Kosan Co. Ltd., 10%; Mitsui and Co., 4.5%; Marubeni Corp. 4.5%]	Ras Laffan	146,000
Do.	do.	Oryx GTL Ltd. [Qatar Petroleum (QP), 51%, and Sasol Ltd., 49%]	do.	12,400
Sand, washed		Qatar National Cement Co. (QNCC) (Government, 43%, and private Qatari investors, 57%)	Umm Bab	10,000
Do.		Qatar Sand Treatment Plant (Qatar Industrial Manufacturing Co. (Q.S.C.)	do.	1,000
Sulfur:				
Elemental		Ras Laffan Liquefied Natural Gas Co. Ltd. (RasGas)	do.	400
Do.		Qatar Petroleum (QP) (Government, 100%)	Mesaieed	100
Do.		Qatar Petrochemical Co. Ltd. Q.S.C. (QAPCO)	Umm Said	100
Do.		Qatar Liquefied Gas Co. Ltd. Q.S.C. (Qatargas)	Ras Laffan	300
Sulfuric acid		Qatar Industrial Manufacturing Co. (Q.S.C.)	Mesaieed	11

Do., do. Ditto.
[1]Operated under a development and production-sharing agreement with Qatar Petroleum.
[2]El Bunduq field is located on the border between Qatar and the United Arab Emirates. Royalties are shared by the Governments.

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The Mineral Industry of Saudi Arabia

By Waseem A. Abdulameer

In 2013, the Kingdom of Saudi Arabia was only a moderate producer of metallic mineral commodities, mineral ores, and clays, despite its plentiful mineral reserves. The country was a major world producer of petroleum and refined hydrocarbons. Saudi Arabia had the leading economy in the Middle East and North Africa region and one of the world's 20 leading economies (Saudi Arabian General Investment Authority, 2015). Although the Saudi economy was dominated by the petroleum industry in 2013, many mineral development projects continued to progress, including an integrated aluminum project, a copper and zinc project, and a phosphate rock development project. In the petroleum sector, a new offshore crude oil field, which was considered to be the world's fifth largest in terms of resources, was put into production in 2013. A major offshore natural gas project was delayed. Saudi Arabia was the world's second-ranked petroleum liquids producer in 2013 behind the United States, averaging daily production of 11.6 million barrels (Mbbl). Saudi Arabia was the world's 12th-ranked total primary energy consumer in 2013 and consumed about 228 million metric tons (Mt) oil equivalent of petroleum and natural gas for energy generation (BP p.l.c., 2014, p. 40–41; U.S. Energy Information Administration, 2014). By yearend 2013, Saudi Arabia was the world's second-ranked crude oil producer behind Russia and held about 16% of the global crude oil reserves, which was about 266 billion barrels (Gbbl). Saudi Arabia held the world's sixth largest natural gas reserves, which totaled about 8 trillion cubic meters, behind Russia, Iran, Qatar, Turkmenistan, and the United States. Saudi Arabia produced aluminum and phosphate rock for the first time in 2013. The country produced industrial minerals, such as cement, nitrogen and phosphate fertilizers, and sulfur, on a moderate scale (table 1; Arab Fertilizers Association, 2014, p. 15–21; BP p.l.c., 2014, p. 6, 8, 20, 22; HSBC Global Connections, 2014; Organization of the Petroleum Exporting Countries, 2014, p. 22–23; Saudi Arabian Oil Co., 2014, p. 19, 21).

Government Policies and Programs

In July 2013, The Government of Saudi Arabia decided to open its domestic stock exchange (Tadawul) to foreign investors by yearend 2014; the Tadawul was established through article 20 of the Capital Market Law on July 15, 2013. The Government also decided to offer tax incentives for corporations that recruit and train the Saudi labor force in some regions of the country, including the regions of Al-Baha, Al-Jouf, Hail, Jazan, and Najran, and along the northern borders. The two decisions were expected to lead to increased diversification of the economy and to create more job opportunities for Saudi nationals (Saudi-U.S. Relations Information Service, 2014; Saudi Arabian General Investment Authority, 2015).

Royal Decree No. 47 M (the mining investment code) of October 4, 2004, as revised, is the law that regulates the mining and quarrying industry in Saudi Arabia. According to the law, the Agency of Petroleum and Mineral Resources supervises mining activities, promotes investments, provides services, and issues several types of mining licenses and concessions in the country, including three types of licenses categorized as nonexploitation licenses and four types of licenses categorized as exploitation licenses. Nonexploitation licenses include reconnaissance and material collection licenses and are valid for 2 years; exploitation licenses are valid for 3 years. Although the law requires that all corporations and persons obtain licensing permits for the reconnaissance, exploration, exploitation, and material collection, the Saudi Geological Survey and the King Abdulaziz City for Science and Technology are exempted from this regulation. The decree allows the granting of mining rights to other corporations and persons, whether they are Saudi citizens or not, and permits the rights to be transferred to other corporations or persons with technical and financial competence and expertise. The decree also permits the exemption of some minerals and materials, such as petroleum, natural gas, and organic marine substances, from its rulings. By yearend 2012 (the latest year for which comprehensive data were available), the total number of valid mining licenses in Saudi Arabia was 1,643. Those licenses were for exploration (266), small mines (75), prospecting (32), quarrying and exploitation of cement raw materials (32), and quarrying and exploitation of other ores and industrial minerals, such as clay, dolomite, iron, and schist (27) (Glennie and others, 2011; Saudi Arabian Monetary Agency, 2013, p. 151; U.S.-Saudi Arabian Business Council, 2015, p. 1).

Minerals in the National Economy

Saudi Arabia's economy continued to grow in 2013, supported by the revenues from the oil sector, which accounted for 47.4% of the gross domestic product (GDP). Saudi Arabia registered a GDP growth rate of 3.8% in 2013 in real terms compared with 5.9% in 2012 owing mainly to the decreased global crude oil prices and a slight reduction in the volume of petroleum exports. According to the Organization of the Petroleum Exporting Countries (OPEC), Saudi Arabia's price for Arabian heavy crude petroleum averaged $103.89 per barrel in 2013 compared with $108.32 per barrel in 2012, which was a 4% decrease. In 2013, Saudi mining and quarrying activity (which includes part of the oil sector) accounted for 44.8% of the GDP; manufacturing activity, 10.1%; construction activity, 4.8%; and refined petroleum activity, 2.4%. The hydrocarbon sector's share of the GDP decreased by 4.1% in 2013, whereas the share of the nonhydrocarbon sector registered a 5.4% increase compared with that of 2012 (Bank Audi S.A.L., 2014, p. 1–2, 4–7; Organization of the Petroleum Exporting Countries, 2014, p. 83).

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Mineral Trade

Saudi Arabia's total foreign trade value was $544 billion in 2013, which was a slight increase from that of 2012. The volume of exports decreased by 3.2% in 2013, but the volume of imports increased by 8.1% compared with that of 2012, respectively. Mineral products (primarily hydrocarbons) accounted for 85.7% of total exports, which was a 4.6% decrease from that of 2012. Non-oil exports accounted for 14.3% of the total in 2013, which was a 6% increase from that of 2012. Machinery and transport equipment accounted for 43.3% of total Saudi imports, and chemicals and base metal products accounted for 22.9% (Bank Audi S.A.L., 2014, p. 6–7).

In terms of volume, Saudi Arabia exported an average of 7.7 million barrels per day (Mbbl/d) of crude oil in 2013. Asia received the majority (53.8%) of total Saudi crude oil exports followed by the United States (17.1%) and the rest of the world (29.1%). The majority (about 78%) of Saudi Arabia's refined products was shipped to Asia (U.S. Energy Information Administration, 2014).

In 2013, Saudi Arabia ranked as one of the leading ammonia exporters in the Middle East and North Africa region. Saudi Arabian Mining Co. (Ma'aden) increased its diammonium phosphate (DAP) exports to India (the world's leading DAP importer) and accounted for about 12% of India's total market share in 2013 compared with 3% in 2012 (Arab Fertilizers Association, 2014, p. 15, 27).

Saudi Arabia was the 10th-ranked goods trading partner with the United States and accounted for $71 billion in trade balance value in 2013. Saudi Arabia was the 19th-ranked U.S. export market and accounted for about $19 billion of the total U.S. export value in 2013, which was a 5.7% increase from that of 2012. The major Saudi imports from the United States were, in order of value, vehicles, machinery, and aircraft. Saudi Arabia was the eighth-ranked supplier of goods to the United States and accounted for about $52 billion of the total U.S. import value in 2013, which was a 6.9% decrease compared with its share in 2012. The major Saudi exports to the United States were mineral fuel (oil), organic chemicals, fertilizers, and iron and steel (Office of the United States Trade Representative, 2015; U.S. Census Bureau, 2015).

Production

In 2013, Saudi Arabia produced 187,000 metric tons (t) of aluminum ingot, which was the first year that the country produced this mineral commodity. Copper and zinc production increased significantly—by 66% and 87%, respectively—owing to the Al Masane copper-gold-silver-zinc project's first full year of production. Direct-reduced iron (DRI) production increased by 6%. Low-grade bauxite production increased by 37% compared with that of 2012. The Az Zabirah Mine produced 1 Mt of phosphate rock in 2013, which was the mine's first year of production of this mineral commodity. The country's ammonia production decreased by 13%, and urea, by 29%. Production of jet fuel and kerosene increased by about 56%, and production of gasoline and naphtha decreased by about 55% (table 1).

Structure of the Mineral Industry

In 2013, the Government maintained ownership interest in the majority of large companies that operated in the mineral sector and played a significant role in supporting the private mineral sector through the Public Investment Fund (PIF) and the Saudi Industrial Development Fund (SIDF). In 2013, the major domestic mining companies that operated in Saudi Arabia included Al Masane Al Kobra Mining Co. (AMAK), Ma'aden, United Arabian Mining Co. (Manajem), and Saudi Basic Industries Corp. (SABIC) (Saudi Industrial Development Fund, 2015).

Ma'aden produced gold through its wholly owned subsidiary Ma'aden Gold and Base Metals Co. (MGBM) and phosphate rock through Ma'aden Phosphate Co. (MPC), which was a joint venture of Ma'aden (70%) and SABIC (30%). Ma'aden Wa'ad Al-Shamal Phosphate Co. (MWSPC), which was a joint venture of Ma'aden (60%), Mosaic Co. of the United States (25%), and SABIC (15%), was expected to operate an integrated phosphate project in northern Saudi Arabia. Ma'aden produced aluminum and bauxite through Ma'aden Bauxite and Alumina Co., which was a joint venture of Ma'aden (74.9%) and Alcoa Inc. of the United States (25.1%). AMAK, which was a joint venture of local investors (53%), Arabian American Development Co. of the United States (37%), and Arab Mining Co. (ARMICO) of Jordan (10%), produced copper and zinc concentrate in addition to gold and silver. The Khnaiguiyah for Mining Co. LLC (KMC), which was working on a copper and zinc project that was expected to start production in 2016, was a joint venture between Manajem (50%) and Alara Resources Ltd. of Australia (50%) (Alcoa Inc., 2011; Alara Resources Ltd., 2013, p. 19–21; Arab Mining Co., 2014, p. 21; Saudi Arabian Mining Co., 2015a).

The Ministry of Petroleum and Mineral Resources and the Supreme Council for Petroleum and Minerals managed the petroleum sector in the country through Saudi Arabian Oil Co. (Saudi Aramco), which was the national oil company, and its subsidiaries. Together, Saudi Aramco and its subsidiaries invested in upstream and downstream petroleum and natural gas, petrochemicals, water, and renewable energy industries in 2013. Saudi Aramco Mobil Refining Co. Ltd. (SAMREF) was a joint venture between Saudi Aramco (50%) and Mobil Yanbu Refining Co. Inc. (a subsidiary of Exxon Mobil Corp. of the United States) (50%), which conducted its operations, including producing fuels, in Yanbu Industrial City, which is located on the west coast of the country. Saudi Aramco Total Refining and Petrochemical Co. (SATORP), which conducted its operations in Jubail Industrial City on the east coast of the country, was a joint venture between Saudi Aramco (62.5%) and Total S.A. of France (37.5%). Saudi Aramco Shell Refining Co. (SASREF), which also conducted its operations in Jubail, was a joint venture between Saudi Aramco and Shell Saudi Arabia Refining Ltd. (50% each). Rabigh Refining & Petrochemical Co. (PetroRabigh), which conducted its operations on the west coast of the country, was a joint venture among Saudi Aramco and Sumitomo Chemical Co. of Japan (37.5% each) and private investors (25%). Yanbu Aramco Sinopec Refining Co. Ltd. (YASREF), which was expected start its operations in Yanbu by yearend 2014, was a joint venture

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between Saudi Aramco (62.5%) and China Petrochemical Corp. (SINOPEC) of China (37.5%). Vela International Marine Ltd., which was wholly owned by Saudi Aramco, operated 15 very large crude carriers that transported Saudi crude oil within the Middle East and to Europe and the United States (table 2; Rabigh Refining and Petrochemical Co., 2013, p. 12; Saudi Arabian Oil Co., 2014, p. 19, 21, 33, 63; U.S. Energy Information Administration, 2014; Yanbu Aramco Sinopec Refining Co. Ltd., 2015).

Commodity Review

Metals

Aluminum.—In 2013, Ma'aden Aluminium Co. began initial production from its aluminum smelter, which was located at Ras Al-Khair about 90 kilometers (km) northwest of Jubail. The smelter was expected to be operating at full capacity by 2014, when it was projected to produce 740,000 metric tons per year (t/yr) of primary aluminum. Construction of Ma'aden's $10.8 billion fully integrated aluminum project continued to progress in 2013 and was expected to be completed in 2014. Although an unplanned shutdown in one of the smelter's potlines halted construction temporarily between mid-October and late December 2013, Ma'aden was able to restore production with minimal effect. Ma'aden Rolling Co. completed construction on its 380,000-t/yr rolling mill in 2013. The mill was expected to start commercial production in mid-2014 and to receive about 51% of the aluminum produced by Ma'aden's smelter for reshaping (Al Arabiya News, 2013; Alcoa Inc., 2013; Albilad Capital, 2014, p. 4; Saudi Arabian Mining Co., 2014, p. 21, 33, 80–81).

Bauxite and Alumina.—The output of low-grade bauxite by Ma'aden Industrial Minerals Co. (MIMC) from the Az Zabirah Mine increased significantly to 1,044,360 t in 2013 from 760,114 t in 2012. The volume of low-grade bauxite sales increased by about 12% in 2013 compared with that of 2012 owing to the increased consumption by the domestic cement companies (Albilad Capital, 2014, p. 6; Saudi Arabian Mining Co., 2014, p. 66–67).

The Ma'aden Bauxite and Alumina Co. Mine and ore-crushing facility was located in Al Ba'itha near Quiba in the northeastern part of the country about 600 km northwest of Ras Al-Khair. The mine was part of the new integrated aluminum project and was expected to start production with an initial capacity of about 4.0 Mt/yr of bauxite ore near yearend 2014. The ore would be transported by rail to the alumina refinery in Ras Al-Khair, which would have the capacity to produce about 1.8 Mt/yr of alumina. Ma'aden's alumina refinery, which was projected to be the first of its kind in the Middle East, would supply alumina for the company's aluminum smelter and rolling mill (Saudi Arabian Mining Co., 2014, p. 21, 80).

Copper and Zinc.—In 2013, AMAK continued copper, silver, and zinc operations in the southwestern quadrant of Saudi Arabia, and by yearend, the company shipped 39,760 t of copper and 42,254 t of zinc concentrates to customers in Asia, which exceeded previous company plans. AMAK's production was expected to be affected because of a scheduled 2-week shutdown for maintenance operations that would take place around mid-2014. Nevertheless, the company was projected to produce 30,000 t of copper concentrate and 41,000 t of zinc concentrate in 2014 (Arab Mining Co., 2014, p. 21; PR Newswire, 2014).

By yearend 2013, the Jabal Sayid underground copper mine, which was located 350 km northeast of Jeddah, was estimated to have about 650,000 t of contained copper in measured and indicated resources. Ma'aden was planning to invest about $210 million to acquire a 50% stake in the project, and Barrick Gold Corp. of Canada would own the other 50%. The agreement was expected to be made final by yearend 2014, and plans were in place for the project to ship its first low-cost copper concentrate by early 2016. Once the mine was operating at full capacity, it was expected to produce about 45,000 t/yr of copper concentrate for the first 5 years. The project's mining license permitted further mining exploration in the surrounding licensed area, which could extend the mine's life (presently estimated to be about 15 years). The project was expected to provide more than 400 direct jobs and other indirect jobs locally (Albilad Capital, 2014, p. 6; Barrick Gold Corp., 2014; Saudi Arabian Mining Co., 2015b).

Gold.—In 2013, MGBM produced a total of 3,789 kilograms (kg) of gold from five operational mines. Those included 1,283 kg from the Al Amar Mine, which was a 34% increase from that of 2012; 1,415 kg from the Bulgah Mine, which was a 37% increase from that of 2012; and 1,060 kg from the Mahd Adh-Dahab Mine, which was a 28% increase from that of 2012. In addition, the Al-Hajar Mine, which produced 25 kg of gold, was mined out and closed in 2013, whereas the Sukhaybarat Mine produced about 6 kg of gold, which was a slight increase from that of 2012. The value of MGBM's gold production accounted for 12% of Ma'aden's consolidated revenues in 2013. About 75% of the gold and base metals produced by MGBM was shipped to MKS S.A. of Switzerland.

Ma'aden's Massarah project was part of the development in the Central Arabian gold region in 2013. A prefeasibility study of the project indicated a deposit of about 60 Mt at an average grade of 2.5 grams per metric ton (g/t) gold. Nevertheless, Ma'aden continued to evaluate the project because of the prospective challenges that would result from mining and transporting the gold owing to the remote location and the limited availability of infrastructure. Notably, in 2013, MGBM completed construction work in its gold mine at As Suq, which was projected to start production around mid-2014. Ma'aden also awarded a $267 million contract to Hanwha Engineering and Construction Company Ltd. of the Republic of Korea to design and build a 2-million-metric-ton-per-day gravity and carbon-in-leach gold processing plant for the Ad Duwayhi Mine at the Central Arabian gold region. Ma'aden was expected to increase its gold production to about 15,600 kg/yr by 2017 (Albilad Capital, 2014, p. 5; Saudi Arabian Mining Co., 2014, p. 17, 72–73, 105–106).

Iron and Steel.—In 2013, Saudi Arabia produced about 5.5 Mt of crude steel, which was about a 5% increase compared with that of 2012. Crude steel demand in Saudi Arabia was estimated to be twice the country's current production. Saudi Iron and Steel Co. (Hadeed), which was a wholly owned

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subsidiary of SABIC, had an integrated iron and steel complex in Jubail with a capacity to produce 2.2 million metric tons per year (Mt/yr) of flat products and 3.3 Mt/yr of long products. In 2013, Hadeed produced a record 2.3 Mt of flat products, which exceeded the design capacity by 15%. Hadeed's plants A and B, C, D, and E in Jubail, which had DRI capacities of 0.8 Mt/yr, 0.65 Mt/yr, 1.1 Mt/yr, and 1.76 Mt/yr, respectively, accounted for a majority of the country's 6% production increase in 2013 (Midrex Technologies Inc., 2014, p. 10–11; Saudi Basic Industries Corp., 2014, p. 66, 69; 2015).

Ma'aden was exploring plans to start producing base metals in 2013. SABIC was in the study phase for two steel plants. The first plant would be located in Jubail and have the capacity to produce 1.5 Mt/yr of steel products. The second plant would be located in Rabigh and have the capacity to produce 1 Mt/yr of steel products.

The Wadi Sawawin iron ore project, which was a joint venture of National Mining Co. of Saudi Arabia and STX Heavy Industries (a subsidiary of the STX Group of the Republic of Korea) was canceled in 2013 (HSBC Global Connections, 2014; Saudi Arabian Mining Co., 2014, p. 21; World Steel Association, 2014, p. 2)

Industrial Minerals

Cement.—The Saudi cement sector, which had a capacity of about 62 Mt/yr in 2013, was one of the established industrial sectors in the country. Saudi Arabia produced about 57 Mt of cement in 2013, which was a slight increase compared with that of 2012. The cement produced in the central and western parts of the country accounted for about 29% and 25% of the country's total, respectively. About 16 private companies operated in the Saudi cement sector. The Government provided subsidized natural gas, which was necessary to operate the local cement factories, through Saudi Aramco and regulated all trading activities. In 2013, coordination continued between the cement companies, the Government, and Saudi Aramco to settle disputes regarding natural gas allocations. The Saudi cement sector continued its growth in 2013 and was expected to increase its capacity to about 66 Mt/yr by 2015 (Aljazira Capital, 2013, p. 1–5; HSBC Global Connections, 2014; Karmani, 2014, p. 31; Kuwait Finance House, 2014).

Clay and Shale and Magnesite.—MIMC produced 64,298 t of kaolin from the Az Zabirah Mine in 2013 compared with 52,502 t in 2012. The volume of kaolin sales increased significantly by about 52% in 2013 compared with that of 2012 owing to the increase in demand from the MPC's plant in Ras Al-Khair. MIMC also processed 75,000 t of magnesite ore from its mine at Al Ghazalah and produced 29,500 t of caustic calcined magnesia at its processing plant in Al Madinah Al-Munawwara Industrial City (Albilad Capital, 2014, p. 6; Saudi Arabian Mining Co., 2014, p. 66–67).

Nitrogen.—Ma'aden subsidiary MPC produced 0.96 Mt of ammonia in 2013, which was a 12% decrease compared with the 1.09 Mt produced in 2012. The company produced less ammonia in 2013 mainly owing to the use of more ammonia internally to produce DAP but also because of an unexpected shutdown of the company's production plant in April. Ammonia use by Ma'aden for DAP production increased by about 20% to 1.82 Mt in 2013 from 1.53 Mt in 2012. This increase resulted after 1 year of full-scale production from the Ras Al-Khair plant, which was expected to produce about 3 Mt/yr of nitrogen once it reached full capacity. Saudi Arabian Fertilizer Co. (Safco), which was a $500 million domestic joint venture between SABIC (43%) and private investors (57%), was expected to start commercial urea production by 2015. Once completed, Safco-5 (the company's urea plant, which is located 100 km north of Dammam on the east coast of the country) was expected to produce 1.2 Mt/yr of nitrogen (Arab Fertilizers Association, 2014, p. 15–16, 19, 22; Saudi Arabian Mining Co., 2014, p. 76–77; Thapliyal, 2014).

Phosphate Rock.—MPC, which was a $5.6 billion investment, continued to operate two projects in 2013. The first project was at the Ras Al-Khair complex that produced fertilizers. The second project was at the Al Jalamid site, which is located about 150 km east of Turaif in the northern part of the country and included a phosphate mine and an integrated plant that produced 2.8 Mt of phosphate rock. The phosphate rock was then transported to the Ras Al-Khair complex for processing. MWSPC, which was a $7 billion investment project, continued work on the Wa'ad Al-Shamal integrated phosphate project, which is located about 20 km from Turaif. When completed, the project would include the Al Khobra phosphate mine and six phosphate processing plants. Once in operation, the project was expected to have the capacity to produce 1.5 Mt/yr of phosphate rock, 3 Mt/yr of phosphate-based fertilizers, and 440,000 t/yr of other downstream products. The project, which was expected to double Ma'aden's fertilizer production capacity, was projected to be inaugurated by late 2016 (Albilad Capital, 2014, p. 3; Arab Fertilizers Association, 2014, p. 17, 23, 37, 41; HSBC Global Connections, 2014; Saudi Arabian Mining Co., 2014, p. 19).

Mineral Fuels

Natural Gas.—In 2013, Saudi Arabia produced about 114,000 million cubic meters of dry natural gas, which came from natural gas fields associated with major Saudi crude oil fields, such as the Ghawar field, which accounted for about 60%, and the Safaniya and the Zuluf fields, which accounted for 10% each of the country's total natural gas production. The Karan field, which was the first offshore nonassociated gasfield in Saudi Arabia, continued to operate in 2013 and produced 4.2 million cubic meters per day of natural gas.

Saudi Aramco's Wasit gas project, which was expected to become the leading natural gas project in Saudi Arabia, was delayed because of budgetary issues in 2013 and was projected to be completed by 2016 rather than 2014. The Wasit gas project was expected to comprise two offshore natural gas fields near the east coast of Saudi Arabia. The first offshore field, which would have a capacity to produce about 28.5 million cubic meters per day, is located at the Arabiyah site, and the second field, which would have the capacity to produce about 31 million cubic meters per day, is located at the Habash site.

Saudi Aramco continued its exploration operations in natural gas in 2013 throughout Saudi Arabia, with the aim of increasing the country's production. Saudi Aramco reported that

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it had completed the drilling of 50 natural gas exploration and development wells. The company also reported the discovery of two new natural gasfields at the Turayqa area in the Rub' Al-Khali Desert in the southeastern part of the country and the Mihwaz area in the central part of the country (Saudi Arabian Oil Co., 2014, p. 18–19; U.S. Energy Information Administration, 2014).

Petroleum.—In 2013, Saudi Arabia, which had the world's largest crude-oil-production capacity, produced a daily average of 9.6 Mbbl of crude oil and about 2.0 Mbbl of noncrude liquids. About 0.3 Mbbl/d of the country's crude-oil-production capacity came from its share of the Neutral Zone, which was a 5,776-square-kilometer area shared by Kuwait and Saudi Arabia. In 2013, Saudi Aramco produced different grades of crude oil from onshore and offshore fields; most of this oil was considered sour because it contained high levels of sulfur. The majority of the Saudi sour crude oil came from the offshore fields, whereas the sweet crude oil came from the onshore fields. The country had nine streams of crude oil in 2013. Saudi Aramco operated the world's leading petroleum-processing facility, which was a 7.0-Mbbl/d-capacity facility located in Abqaiq, Ash Shargiyah Province.

The Manifa oilfield was put into production in April 2013 and achieved production of 0.5 Mbbl/d in July 2013. Once it is operating at full capacity, the Manifa oilfield was expected to produce 0.9 Mbbl/d of crude oil, 2.55 million cubic meters per day of natural gas, and 65,000 barrels per day (bbl/d) of condensate. YASREF was expected to have the capacity to process about 400,000 bbl/d of crude oil from the Manifa plant by late 2014.

Saudi Aramco continued to explore for petroleum throughout Saudi Arabia in 2013 with the goal of sustaining its production levels of crude oil. The company reported that it had completed the drilling of 29 oil exploration and development wells, bringing the total number of discovered fields to 121 by yearend 2013. The company also reported the discovery of three new oilfields at Al-Haryd in the Red Sea, at Duhul, and at Salsal, respectively.

In 2013, Saudi Aramco had eight domestic refineries with a combined capacity of 2.5 Mbbl/d. Saudi Aramco produced refined petroleum products through its wholly owned subsidiaries in Jeddah, Ras Tanura, Riyadh, and Yanbu, in addition to other established domestic joint ventures with major world petroleum companies. Saudi Aramco was working on the development of the Jazan refinery, which is located in the southwestern part of the country, and was projected to have the capacity to process 400,000 bbl/d of crude oil by yearend 2016 (Saudi Arabian Oil Co., 2014, p. 18–21, 32–33; U.S. Energy Information Administration, 2014).

Outlook

Saudi Arabia's GDP growth is expected to stay at about 4% for the next 2 years (International Monetary Fund, 2014, p. 7). The Government is projected to continue funding infrastructure projects in the country as a part of its ninth development plan (2010 to 2014) by allocating about one-half of a $385 billion investment fund for the housing and real estate sectors, and the rest for the energy, transportation, and utilities sectors (Ministry of Economy and Planning, 2010). The Government is expected to continue its strategy of collaborating with foreign investors and introducing new projects to the mineral industry; this strategy was developed to diversify the economy away from the hydrocarbon sector and encourage the creation of new job opportunities for the Saudi labor force in different industries, such as nonfuel mining and quarrying. The implementation of this strategy, however, is projected to take place gradually, and the results to be seen in the long run. Meanwhile, the hydrocarbon sector, supported by upstream and downstream expansions, such as the Manifa crude oil project, the Karan natural gas project, and the Al Wasit project, is expected to hold its role as the core of the Saudi economy and provide the necessary funding for the nonhydrocarbon development projects.

In light of Saudi Arabia's completion of the integrated aluminum project in 2014, it is expected that the country may become established as a major bauxite and alumina producer and play a role in the regional aluminum industry in the short run. Saudi Arabia's fertilizer industry is projected to grow significantly within the next 3 years; additional phosphate and nitrogen products were expected to come from the Ras Al-Khair and Wa'ad Al-Shamal projects. Although the demand for cement is expected to increase in Saudi Arabia, the cement industry in the country is projected to continue its moderate growth in the next 2 years primarily because of the limited fuel allocations by the Government and the related disputes with Saudi Aramco. Saudi Arabia's copper, gold, and zinc mining industries are expected to grow notably when the new development projects are inaugurated within the next 3 years (Bank Audi S.A.L., 2014, p. 4–5, 15; Kuwait Finance House, 2014; U.S. Energy Information Administration, 2014; Saudi Arabian General Investment Authority, 2015).

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TABLE 1

SAUDI ARABIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011[e]	2012[e]	2013[e]
METALS						
Alumium, primary		--	--	--	--	187
Bauxite, low grade, for cement		246	284	206 [3]	760	1,044 [3]
Copper content of concentrate	metric tons	1,719	1,603	1,620 [3]	6,000	9,950 [3]
Gold content of concentrate and bullion	kilograms	4,857	4,476	4,674 [3]	4,347 [3]	3,789 [3]
Iron and steel:						
Direct-reduced iron		5,000	5,500	5,800	5,700	6,070
Ferroalloys[e]	metric tons	178,000	177,000	212,000	196,000	196,000
Low-grade iron ore, for cement[e]		600	700	750	760	750
Steel, crude[e]		4,700	5,000	5,300	5,200	5,471 [3]
Lead content of concentrate	metric tons	347	543	550	550	550
Silver content of concentrate and bullion	kilograms	8,527	7,670	7,900	7,900	7,900
Zinc content of concentrate	metric tons	4,952	4,897	4,934 [3]	15,000	28,000
INDUSTRIAL MINERALS						
Barite[e]	metric tons	30,000	30,000	30,000	30,000	32,000
Cement, hydraulic		46,000 [r]	47,500 [r]	50,700 [r,3]	56,200 [r]	57,000
Clays:						
Kaolin	metric tons	4,166	6,200	5,000	58,000	64,000 [3]
Other, for brick and tile		4,700	5,800	6,000	6,000	6,000
Feldspar	metric tons	55,000	42,300	160,000	168,000	100,000
Fertilizer, phosphatic, P_2O_5 content[e]		300	300	300	960	845 [3]
Gypsum, crude		2,000	2,100	2,239 [3]	2,351 [3]	2,500
Magnesite	metric tons	--	24,993 [e]	159,284 [3]	39,000	29,500 [3]
Nitrogen:[e]						
N content of ammonia		2,400	2,600	3,100	3,700	3,209 [3]
N content of urea		1,600	1,700	1,700	2,200	1,559 [3]
Phosphate rock:						
Gross weight		--	--	--	--	2,810 [3]
P_2O_5 content		--	--	--	--	1,000 [e]
Salt		1,640	1,800	1,864 [3]	1,957 [3]	2,000
Sand and stone:						
Aggregate		259,000	277,000	2,727,000 [3]	2,863,500 [3]	3,000,000
Dolomite		669	583	616 [3]	647	700
Granite		1,100	1,100	993 [3]	1,043 [3]	1,000
Limestone:						
Blocks		522	704	770	809	800
For cement		46,900	45,749	46,300	48,615 [3]	48,000
Marble[e]	metric tons	85,000	48,000	24,000	25,000	25,000
Pozzolana and scoria		802	915	1,010 [3]	1,061 [3]	1,000
Sand and gravel		19,000	26,000	25,000	26,670 [3]	25,000
Schist		--	573	738 [3]	775	780
Silica sand (glass sand)		709	820	1,303 [3]	1,368 [3]	1,300
Sulfur, byproduct, hydrocarbon processing		3,214	3,200	4,579 [3]	4,092 [3]	3,250 [3]
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	88,432	97,000	102,000	111,220 [r,3]	114,120 [3]
Dry (methane)	do.	65,000	72,000	76,000	99,300 [r,3]	103,000 [3]
Ethane	do.	11,500	13,800	14,500	15,090 [r,3]	14,080 [3]
Petroleum:						
Crude oil	million 42-gallon barrels	2,888	2,887	3,310 [3]	3,479 [3]	3,517 [3]
Natural gas liquids:						
Propane	do.	152	168	175	189	177 [3]
Butane	do.	101	107	114	123	114 [3]
Condensate	do.	83	94	93 [3]	82	87 [3]
Natural gasoline and other	do.	74	76	78 [3]	89	78 [3]

See footnotes at end of table.

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TABLE 1—Continued
SAUDI ARABIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011[e]	2012[e]	2013[e]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum—Continued:						
Refinery products:						
Liquefied petroleum gases	thousand 42-gallon barrels	13,677	12,846 [4]	12,000	11,300	11,103 [3]
Gasoline and naphtha	do.	180,076	167,807 [4]	196,000	200,000	90,456 [3]
Jet fuel and kerosene	do.	56,674	45,957 [4]	58,000	60,000	93,860 [3]
Distillate fuel oil	do.	210,778	196,453 [4]	222,000	225,000	219,766 [3]
Residual fuel oil	do.	158,944	122,705 [4]	144,000	160,000	166,184 [3]
Unspecified[5]	do.	17,034	18,212 [4]	18,700	17,700	19,604 [3]
Total	do.	637,183	563,980	651,000	674,000	600,973 [3]

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. -- Zero.

[1]Table includes data available through January 20, 2015.

[2]In addition to commodities listed, carbon black, lime, and methanol were produced, but available information is inadequate to make reliable estimates of output.

[3]Reported figure.

[4]Does not include refined output of Rabigh Refining & Petrochemical Co.

[5]Includes asphalt.

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TABLE 2
SAUDI ARABIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum		Ma'aden Aluminium Co. [Saudi Arabian Mining Co. (Ma'aden), 74.9%, and Alcoa Inc., 25.1%]	Ras Al-Khair, about 90 kilometers northwest of Jubail	740.
Bauxite, low-grade for cement		Ma'aden Industrial Minerals Co. (MIMC) [Saudi Arabian Mining Co. (Ma'aden)]	Central zone, Az Zabirah area	1,050.
Cement:				
Gray portland		Al Jouf Cement Co.	South of Turaif	1,750.
Do.		Arabian Cement Co. Ltd.	Rabigh	4,800.
Do.		Eastern Province Cement Co.	Al Khursaniyah	3,400.
Do.		Najran Cement Co.	About 160 kilometers northwest of Najran	3,000.
Do.		Northern Region Cement Co.	About 190 kilometers west-northwest of Arar	1,700.
Do.		Qassim Cement Co.	Jal al Watah, 18 kilometers north of Buraydah	4,000.
Do.		Riyadh Cement Co.	About 30 kilometers southwest of Riyadh	3,800.
Do.		Saudi Cement Co.	Al Hofuf, about 120 kilometers southwest of Dammam	8,600.
Do.		Southern Province Cement Co. (Government, 52%)	Suq Al Ahad, 10 kilometers northeast of Jazan	2,600.
Do.		do.	Bishah, 550 kilometers southeast of Jeddah	2,000.
Do.		do.	Tihama	1,800.
Do.		Tabuk Cement Co.	Tabuk	1,300.
Do.		Yamama Cement Co. Ltd.	Riyadh	6,300.
Do.		Yanbu Cement Co.	Yanbu Industrial City, on the west coast	4,000.
White		Al-Gharbiah Cement Factory	Jeddah	250.
Do.		Saudi White Cement Co.	About 30 kilometers southwest of Riyadh	200.
Copper, Cu content of ore		Ma'aden Gold and Base Metals Co. [Saudi Arabian Mining Co. (Ma'aden)]	Al Amar Mine, Ar Riyadh Province, and Mahd Adh-Dahab Mine, Al Madinah Province	1.
Do.		Al Masane Al Kobra Mining Co. (AMAK) [Local investors, about 53%; Arabian American Development Co., about 37%; Arab Mining Co. (ARIMCO), 10%]	Al Masane Mine	9.
Gold	kilograms	Ma'aden Gold and Base Metals Co. [Saudi Arabian Mining Co. (Ma'aden)]	Al Amar Mine, Ar Riyadh Province; Al-Hajar Mine, Asir Province; Bulgah Mine, Al Madinah Province; Mahd Adh-Dahab Mine, Al Madinah Province; and Sukhaybarat plant, Al Madinah Province	8,000.
Kaolin	metric tons	Ma'aden Industrial Minerals Co. (MIMC) [Saudi Arabian Mining Co. (Ma'aden)]	Central zone, Az Zabirah	64,000.
Magnesium:				
Magnesite ore		do.	Mine at Al Ghazalah	NA.
Magnesia, caustic calcined		do.	Processing plant, Al-Madinah Al-Munawwara Industrial City, southwest of Medina	39.
Natural gas, gross	million cubic meters	Saudi Arabian Oil Co. (Saudi Aramco) (Government, 100%)	Ghawar field	75,000.
Do.	do.	do.	Karan field	5,000.
Do.	do.	do.	Safaniya field	10,000.
Do.	do.	do.	Zuluf field	10,000.
Nitrogen, N content of ammonia		Ma'aden Phosphate Co. (MPC) [Saudi Arabian Mining Co. (Ma'aden), 70%, and Saudi Basic Industries Corp. (SABIC), 30%]	Ras Al-Khair, about 90 kilometers northwest of Jubail	900.
Petroleum:				
Crude	million 42-gallon barrels	Saudi Arabian Oil Co. (Saudi Aramco) (Government, 100%)	Ash Shargiyah, Najd region, and offshore; includes the Ghawar, Hawtah, Khurais, Safaniya, and Shaybah fields	4,500.
Refinery products	do.	Jeddah Oil Refinery Co. [Saudi Arabian Oil Co. (Saudi Aramco), 100%]	Jeddah	38.

See footnotes at end of table.

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TABLE 2—Continued
SAUDI ARABIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum—Continued:				
Refinery products—Continued	million 42-gallon barrels	Rabigh Refining & Petrochemical Co. (PetroRabigh) [Saudi Arabian Oil Co. (Saudi Aramco), 37.5%; Sumitomo Chemical Co., 37.5%; private, 25%]	Rabigh, on the west coast	140.
Do.	do.	Riyadh Oil Refinery Co. [Saudi Arabian Oil Co. (Saudi Aramco), 100%]	Riyadh	50.
Do.	do.	Saudi Arabian Oil Co. (Saudi Aramco) (Government, 100%)	Ras Tanura	193.
Do.	do.	do.	Yanbu Industrial City, on the west coasst	82.
Do.	do.	Saudi Aramco Mobil Refinery Co. Ltd. (SAMREF) [Saudi Arabian Oil Co. (Saudi Aramco), 50%, and Mobil Yanbu Refining Co. Inc., 50%]	do.	140.
Do.	do.	Saudi Aramco Shell Refining Co. (SASREF) [Saudi Arabian Oil Co. (Saudi Aramco), 50%, and Shell Saudi Arabia Refining Ltd., 50%]	Jubail Industrial City, on the east coast	110.
Do.		Saudi Aramco Total Refining and Petrochemical Co. (SATORP) [Saudi Arabian Oil Co. (Saudi Aramco), 62.5%, and Total S.A., 37.5%]	do.	400.
Phosphate rock		Ma'aden Phosphate Co. (MPC) [Saudi Arabian Mining Co. (Ma'aden), 70%, and Saudi Basic Industries Corp. (SABIC), 30%]	Al Jalamid, 50 kilometers east of Turaif	11,600 ore, 5,000 concentrate.
Steel, crude		National Steel Co. Ltd. (Al Tuwairqi Group, 100%)	Dammam	800.
Do.		Saudi Iron and Steel Co. (Hadeed) [Saudi Basic Industries Corp. (SABIC), 100%]	Jubail Industrial City, on the east coast	5,200.
Titanium dioxide		The National Titanium Dioxide Co. Ltd. (Cristal) (Gulf Investment Corp. of Kuwait; National Industrialization Co. of Saudi Arabia; Shairco Trading Industry and Contracting of Saudi Arabia)	Yanbu Industrial City, on the west coast	100.
Zinc, Zn content of ore		Ma'aden Gold and Base Metals Co. [Saudi Arabian Mining Co. (Ma'aden)]	Al Amar Mine, Ar Riyadh Province, and Mahd Adh-Dahab Mine, Al Madinah Province	2.
Do.		Al Masane Al Kobra Mining Co. (AMAK) (Local investors, about 53%; Arabian American Development Co., about 37%; Arab Mining Co., 10%)	Al Masane Mine	25.

Do., do. Ditto. NA Not available.

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The Mineral Industry of Syria

By Mowafa Taib

Syria was not a significant producer of minerals in 2013 owing to the armed conflict that began in 2011 and continued throughout 2013. Because metals had not been mined in the country in recent years, mining activity was restricted to exploration for and production of fuel and industrial minerals. The mineral commodities that were produced in Syria in 2013 included natural crude asphalt, cement, fertilizer, gypsum, iron and steel, marble, natural gas, crude oil, phosphate rock, salt, silica sand, and volcanic tuff (table 1).

The armed conflict between the Government and several rebel groups continued to cause widespread destruction to commercial, industrial, and residential structures in many parts of the country and to force hundreds of thousands of people to flee their homes to settle in safe areas within the country and in the neighboring countries of Iraq, Jordan, Lebanon, and Turkey. Production of fuel and industrial minerals continued at reduced levels in 2013, especially natural gas, crude oil, and phosphate rock. By 2013, more than 40% of Syria's high-voltage lines were damaged and 30 power stations were inactive owing to the military conflict. The country's capacity to generate electricity, which amounted to 7.8 gigawatts in 2011, was reduced significantly because the power stations depended mainly (94%) on fuel oil and natural gas for power generation (U.S. Energy Information Administration, 2014).

Three types of economic sanctions were imposed against Syria by the United States in previous years and continued in 2013. The first type of sanction was by way of the Syria Accountability Act of 2004, which prohibits the export of most goods manufactured in the United States to Syria. The second type of sanction was through the USA PATRIOT Act, which has specific sanctions against the Commercial Bank of Syria. The third type of sanctions is contained in several Executive orders concerning Syria, which were issued between 2004 and 2012. These sanctions deny certain Syrian citizens, Government agencies, and private companies access to the U.S. financial system because of their association with terrorist organizations and (or) their association with destabilizing activities in Iraq and Lebanon. Executive Order 18582 of August 17, 2011, prohibits imports of petroleum and petroleum products from Syria into the United States and bans individuals from investing and operating in Syria (Obama, 2011; U.S. Department of State, 2014). Consequently, United States trade in goods with Syria, which includes exports and imports, was valued at $40 million per year in both 2012 and 2013 compared with $623 million in 2011 and $932 million in 2010 (U.S. Census Bureau, 2014).

In June 2013, the Council of the European Union (EU Council) extended its sanctions against Syria for another year. These sanctions included an oil embargo and other trade bans as well as restrictions on investments, financial activity, and the transport sector. Additional actions by the EU Council included the freezing assets of a number of entities and individuals associated with the violent repression in Syria, including the Central Bank of Syria (Council of the European Union, 2013).

Government Policies and Programs

Law No. 26 of 2009 grants the state ownership for all surface and subsurface mineral resources within the country's borders and territorial waters. Law No. 91 of January 24, 2010, designates the General Establishment of Geology and Mineral Resources (GEGMR) as the Government agency in charge of all mining and quarrying activities in the country. Under law No. 91, the General Company for Marble and Asphalt as well as the Directorates of Salt Mines and Silica Sands at the General Company for Phosphate and Mines (GECOPHAM) were dissolved and their functions were assigned to the GEGMR. Except for phosphate rock production, which is carried out by the GECOPHAM, the GEGMR carries out virtually all mining activities in Syria either directly or through private contractors, including development, exploration, production activities, field and laboratory analyses, and geologic and geophysical studies. In 2012 (the latest year for which comprehensive data were available), the GEGMR issued 420 mining permits and 92 explosives permits, and fulfilled 13 contracts with private and state-owned cement and construction companies to supply them with such industrial minerals as gypsum, silica sand, and volcanic tuff. The GEGMR promoted investment opportunities in developing such industrial mineral commodities as bentonite, silica sand, volcanic tuff, and zeolites. The GEGMR employed 2,076 people in 2012 (General Establishment of Geology and Mineral Resources, 2013, p. 20, 35–36, 38).

Production

The output of all mineral commodities in 2012 and 2013 was estimated to have decreased by about two-thirds from production levels in 2010 owing to the armed conflict in the country, which made it difficult to operate such mineral industry facilities as cement plants, gasfields and oilfields, iron and steel plants, petroleum refineries, and mines throughout the country. Data on mineral production are in table 1.

Structure of the Mineral Industry

The Government was the major shareholder in the hydrocarbon sector through its ownership of Syrian Gas Co. (SGC) and Syrian Petroleum Co. (SPC) under the umbrella of General Petroleum Corp. (GPC) of the Ministry of Petroleum and Mineral Resources (MOPMR). SGC and SPC held a 50% share in all crude oil and gas projects in Syria. SGC was the state-owned natural gas company. SGC managed the exploitation, marketing, processing, and transportation of natural gas in Syria, whereas SPC was in charge of crude oil exploration, production, and transportation. SPC had partnered with several international oil companies, such as China

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Petrochemical Corp. (Sinopec), Gulfsands Petroleum Plc of the United Kingdom, Oil and Natural Gas Limited Corp. (ONGC) of India, Royal Dutch Shell plc of the United Kingdom, and Total S.A. of France through subsidiary companies. These subsidiaries included Al-Furat Petroleum Co., Deir Ezzor Petroleum Co., Dijla Petroleum Co., Hayan Petroleum Co., Oudeh Petroleum Co., and Syria-Sino Al-Kawkab Oil Co. Most of these companies had stopped their operations in Syria by the end of 2013, however, owing to international sanctions, deteriorating conditions, and the takeover by rebel forces of most of the oilfields in northeastern Syria (General Petroleum Corp., 2014; U.S. Energy Information Administration, 2014).

The Ministry of Industry is responsible for the cement and steel industries in the country through several state-owned enterprises that include the General Organization for Cement and Building Materials (GOCBM), the General Fertilizers Co., and the General Company for Iron and Steel Products (Hadeed Hama). Since 2010, privately operated local companies had been quarrying for industrial minerals that are used as building materials, such as basalt, celestial (white) sand, clays, dolomite, iron oxides, limestone (for cement), marble, sandstone, silica sand, and volcanic tuff. Privately operated cement and iron and steel plants were established based on investment law No. 10 of 1991. The law and its amendment are intended to enhance the flow foreign direct investment into the country and allow for the private sector to take a bigger stake in the economic development of the country. Companies that were established under investment law No. 10 include Al Badia Cement J.S.C. and Lafarge Cement Syria for cement production, and Al Wahib Group, Arabian Steel Co. (ASCO), Hmisho Steel S.A., International Company for Steel Rolling, Joudco Steel Ltd., and Syria Steel and Iron Co. (SALB) for iron and steel production (table 2).

Commodity Review

Metals

Iron and Steel.—The level of activity in the iron and steel sector in Syria continued to decrease because of the adverse effects of the armed conflict, which included shortages in the supply of electricity to steel plants owing to damages to the national grid, weak domestic demand for steel and other building materials, and difficulties in conducting trade with neighboring countries. According to the World Steel Association's latest statistics, crude steel production in Syria decreased to 10,000 metric tons (t) in 2012 and 2013 from 70,000 t in 2011. The country's imports of semifinished and finished steel products, which had exceeded 2 million metric tons (Mt) annually from 2005 to 2011, decreased to 267,000 t in 2013. Similarly, imports of ingots and semifinished steel products decreased to 152,000 t in 2013 from 266,000 t in 2012 and 901,000 t in 2011. The volume of flat, long, and tabular steel products imported in 2013 decreased to 56,000 t, 51,000 t, and 7,000 t from 616,000 t, 371,000 t, and 88,000 t, respectively, in 2011. Apparent steel use per capita dropped to about 22 kilograms (kg) in 2013 from 72 kg in 2011 (World Steel Association, 2014, p. 2, 34, 55, 60, 65, 70, 78, 87).

Industrial Minerals

Cement.—The Al Badia cement plant at Abu Ash-Shamat, which was owned and operated by Al Badia Cement J.S.C., produced 550,000 t of cement in 2013 compared with 916,000 t of cement in 2012. The plant had the capacity to produce 1.6 million metric tons per year (Mt/yr) of cement after the completion of its phase 1 development. The company planned to double its capacity to 3.2 Mt/yr of cement after completion of phase 2; however, the project was put on hold as of yearend 2013. The decrease in cement production for the second consecutive year by Al Badia was attributed to weak demand because of the deterioration of security in the country, illegal trade of cement in the eastern and northern regions of the country, and risks related to the transport of cement to other parts of the country (Al Badia Cement Co. J.S.C., 2014, p. 16, 22).

Production at the Lafarge cement plant in northern Syria was also adversely affected by the armed conflict. Lafarge Cement Syria did not report specific details about operations during 2013. The plant, which uses coal as a source of energy, was owned by Lafarge S.A. (98.67%) and had the capacity to produce 2.6 Mt/yr of cement (Lafarge Group, 2014, p. 34, F72).

In 2013, the GOCBM, which managed nine state-owned cement plants throughout the country, reported an average decrease in cement production of 62% at its plants during the first half of 2013. The company's output during the first 6 months of 2013 decreased to 1.051 Mt from 2.752 Mt in 2012. The company attributed the sharp decrease in output to the sanctions imposed by Western countries that caused a shortage in the foreign currency needed to buy production components, such as clinker, from abroad (Al Watan, 2013).

Phosphate Rock.—Estimates of phosphate rock production and exports decreased to 1 Mt in 2013 following a reported 57% decrease to 1.5 Mt in 2012 from 3.5 Mt in 2011. The decreases were attributed to the deterioration of security in the country and to the call by the International Working Group on Sanctions (IWGS)—which includes 42 countries, the Arab League, and the European External Action Service—to member countries to stop importing phosphate rock from Syria. The call was issued during the seventh meeting of the IWGS, which was held in Ottawa, Ontario, Canada in June 2013 (Voltaire Network, 2013).

European countries had been the major buyers of phosphate rock from Syria, which had held 1.8 billion metric tons of phosphate rock reserves and had had plans to increase its phosphate rock production to 6 Mt/yr before the armed conflict started in 2011. The output of phosphate rock was used by the domestic market as well as by the Lebanese market, in particular, by Selaata Chemicals Co. Sal, which produced phosphoric acid and superphosphate fertilizer. In 2013, the Government agreed to export up to 400,000 t of washed phosphate rock to Iran as part of a barter arrangement (Al-Khalidi, 2013; General Establishment of Geology and Mineral Resources, 2013, p. 42; U.S. Department of State, 2014).

Mineral Fuels

Natural Gas and Petroleum.—According to the BP p.l.c.'s 2014 statistical review of world energy, Syria's crude oil and

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condensate production decreased by 67% to 56,000 barrels per day (bbl/d) in 2013 from 171,000 bbl/d in 2012, which was about a 57% decrease from the 401,000 bbl/d production in 2009; the volume of crude oil production was about 15% of the production level before the conflict. The U.S. Energy Information Administration, however, estimated that Syria's crude oil and condensate output was 25,000 bbl/d in 2013, indicating that crude oil production had decreased by about 90% since the first quarter of 2012. Dry natural gas production decreased by 15% to 4.5 billion cubic meters in 2013 from 5.3 billion cubic meters in 2012. The decrease in crude oil and natural gas production was attributed to the suspension of operations by international oil companies, such as CNPC, Gulfsands, Shell, and Total, because of sanctions and the Government losing control of most of the oilfields in northeastern Syria. The Government estimated that Syria's petroleum sector lost more than $12 billion by yearend 2013 compared with a $4 billion loss by yearend 2012. The estimated losses included direct losses, such as damage to hydrocarbon facilities, oil spills, and theft by rebel groups that controlled most of the crude oil wells in northeastern Syria. Indirect losses included the loss of revenue from oil exports (Ministry of Petroleum and Mineral Resources, 2012; Butter, 2013; BP p.l.c., 2014, p. 8, 22; U.S. Energy Information Administration, 2014).

Syria's proven oil reserves were estimated to be 2.5 billion barrels (Gbbl) by yearend 2012. The U.S. Geological Survey estimated that the Levant Basin, where the largest oilfield discoveries—the Tamar and Leviathan fields—are found, contains about 3.5 trillion cubic meters of recoverable gas and about 1.7 Gbbl of technically recoverable oil. Syria trailed other countries in the region in developing its offshore oil and gas resources. The country's first offshore licensing round in 2007 received only one bid; however, Syrian officials expected that the offshore discoveries made in the Mediterranean Sea along the coasts of Cyprus, Egypt, the Gaza Strip, Israel, and Lebanon could make Syria's offshore blocks more attractive. In 2011, the Ministry of Petroleum and Mineral Resources opened a second international offshore licensing round. The close of the round was originally scheduled for October 2011, but was then rescheduled twice. As of yearend 2013, no new date for completion of the bid round had been announced. In December, MOPMR and Russia's Soyuzneftegaz signed an agreement for Syria's first offshore oil exploration, development, and production in Block 2 of Syria's territorial waters in the Mediterranean Sea. The exploration area covers about 2,190 square kilometers. Soyuzneftegaz expected that the exploration phase would take more than 5 years to complete (ITAR TASS, 2014; U.S. Energy Information Administration, 2014).

Outlook

Syria's economy, which contracted by 30% after 2 years of armed conflict, is expected to shrink further as the third year of the armed conflict continues to severely damage the country's infrastructure and displace thousands of people within and outside the country. The outlook for new exploration and production projects in the mineral sector is likely to remain negative in the near future. Most of the international investors, who pulled out of the country following the deterioration of safety and security throughout the country as well as the imposition of sanctions on Government agencies, private companies, and individuals, are continuing to stay out of the country and are expected to remain so until the armed conflict is resolved. The conflict and sanctions continued to have an adverse effect on Syrian hydrocarbon sector activity, including exploration, development, production, transportation, distribution, and exportation. Syria's prospect of becoming a significant hydrocarbon transit country to Iraq, the Mediterranean area, and Europe is severely diminished.

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TABLE 1
SYRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity		2009	2010	2011	2012	2013[e]
METALS						
Steel:[e]						
Crude		70	70	70	10	10
Manufactured[2]		760	700	890	130	130
INDUSTRIAL MINERALS						
Asphalt		132	157	81	13	10
Cement, hydraulic		5,176	6,000	5,000	6,000 r	4,000
Gypsum		403	540	559	328	300
Nitrogen:						
N content of ammonia		180	169	85	50 e	50
N content of urea		119	116	70	61	61
Phosphate:						
Phosphate rock, mine output:						
Gross weight		2,128	3,167	3,541	1,534	1,000
P_2O_5 content (30%)		740	950	1,062	460	300
P_2O_5 equivalent:						
Phosphatic fertilizers		150	176	85	85	85
Phosphoric acid[e]		100	61	50	50	50
Salt		78	81	71	34	30
Sand and gravel		1,382	1,445	4,956	1,103	1,100
Stone:						
Dolomite, refractory grade[4]		50,000 e	53,300	35,700	21,200	20,000
Gravel and crushed rock[4]		420	400	820	300 e	300
Marble materials		270	300	173 r	80	80
Marble blocks	thousand square meters	301	218	124 r	123	100
Volcanic tuff		958	910	809 r	485 r	324 [3]
Sulfur:						
Byproduct of petroleum and natural gas		25	26	26 e	26	20
Sulfuric acid:[e]						
Gross weight		360	166 [3]	83	40	40
S content		117	54	27	13	13
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross[e]	million cubic meters	7,948 [3]	8,000	9,000	6,000 r	5,000
Dry	do.	5,600	8,000 r	7,100 r	5,300 r	4,500 [3]
Natural gas plant liquids[e]	thousand 42-gallon barrels	3,650	3,650	3,650	1,800 r	1,500
Petroleum:						
Crude	do.	146,365	140,525	119,355	62,415 r	20,440 [3]
Refinery products:						
Liquefied petroleum gas	do.	1,679 r	1,715	1,679 r	NA	NA
Gasoline	do.	12,884 r	12,884 r	12,921 r	NA	NA
Naphtha	do.	4,072	7,080	5,000 r	NA	NA
Kerosene and jet fuel	do.	3,248 r	3,212 r	3,248 r	NA	NA
Distillate fuel oil	do.	29,689	29,346	29,602 r	NA	NA
Residual fuel oil	do.	32,886 r	33,653	32,886 r	NA	NA
Asphalt	do.	2,898	3,000 e	3,000 r	NA	NA
Other	do.	5,644 r	810 r	2,914 r	NA	NA
Total	do.	93,000 r	91,700 r	91,250 r	NA	NA

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. NA Not available.

[1]Table includes data available through September 18, 2014.

[2]Mostly from imported crude and semimanufactured steel.

[3]Reported figure.

[4]Converted to thousand metric tons from thousand cubic meters.

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TABLE 2
SYRIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Asphalt		General Establishment of Geology and Mineral Resources (GEGMR) (Government, 100%)	Al Bishri, Dayr az Zawr, and Kafriyah, Latakia	100
Cement		Adra Cement and Building Materials Co.[1]	Adra	1,500
Do.		Al-Badia Cement Co. J.S.C. (Al Muhaidib Holding Co., 29.5%; Syrinvest Holding B.V., 26%; Pubic stockholders, 15%; Menaf S.A.S., 12%; Ziad Al Zaim, 7.5%; Al Fozan Holding Co., 5%)	Abu ash Shamat	1,600
Do.		Al-Hasakeh Cement L.L.C. (Guris Holdings, 100%)	Clinker mill at Al-Hasakeh	700
Do.		Al-Shahaba Cement and Building Materials Co.[1]	Sheikh Said, Aleppo	740
Do.		do.	Maslamieh, Aleppo	220
Do.		Arabian Cement Co.[1]	do.	876
Do.		Guris Raqqa Cement Co. (Guris Holdings, 100%)	Clinker mill at Ar Reqqah	1,500
Do.		Lafarge Cement Syria (Lafarge S.A., 98.67%, and Mas Economic Group S.A., 1.33%)	Ayn Al-Arab, Aleppo	2,600
Do.		Military Housing Cement Group (Government, 100%)	Musselemieh	336
Do.		Rastan Cement and Building Materials Co.[1]	Rastan	130
Do.		The Syrian Company for Cement and Building Materials[1]	Hama cement plant 1	1,330
Do.		do.	Hama cement plant 2	328
Do.		do.	Hama cement plant 3	1,200
Do.		Tartus Cement and Building Materials Co.[1]	Tartus	1,825
Gypsum		General Establishment of Geology and Mineral Resources (GEGMR) (Government, 100%)	Ar Reqqah, Jayrud, and Latakia	573
Marble		do.	Zobar, Latakia, and Sabboura	600
Natural gas	million cubic meters	Al-Furat Petroleum Co. [Syrian Petroleum Co, 50%, and a consortium of Syria Shell Petroleum Development B.V., Himalaya Energy Services B.V., and China National Petroleum Corp. (CNPC), 50%]	Processing plant at Omar field	2,400
Do.	do.	Ebla Petroleum Co. [Suncor Energy Inc., 50%, and General Petroleum Corp. (GPC), 50%]	Ash Shaer and Cherrife	2,500
Do.	do.	Syrian Gas Co. (Government, 100%)	Arak	13,770
Do.	do.	do.	Dubayat	14,872
Do.	do.	do.	Processing plant at Dayr az Zawr	4,750
Do.	do.	do.	Processing plant at Palmyra	2,200
Do.	do.	do.	Processing plant at Jebissa	1,060
Do.	do.	do.	Processing plant at Suwaydiyah	240
Do.	do.	do.	Abu Rabah, Al-Fayed north, Qumqum, Bilas, Al-Rasm, and Abu Al Dhuhr	1,825
Nitrogen:				
Ammonia[2]		General Fertilizers Co. (Government, 100%)	Homs	300
Urea		do.	do.	330
Fertilizers		do.	do.	200
Petroleum:				
Crude	thousand 42-gallon barrels	Al Bou Kamal Petroleum Co. [General Petroleum Corp. (GPC), 50%, and Tatneft Oil Co., 50%]	Al Kishima oilfield	NA
Do.	do.	Al-Furat Petroleum Co. [General Petroleum Corp. (GPC), 50%; Syria Shell Petroleum Development B.V., 31.25%; Himalaya Energy Syria B.V., 18.75%]	Al Izba, Al Ward, Galban, Jarnof/Saban, Maleh/Azraq, Omar/Omar North, Sijan, Tanak, and Thayyam fields	NA
Do.	do.	Deir Ezzor Petroleum Co. [General Petroleum Corp. (GPC), 50%, and Total S.A., 50%]	Al-Mazraa, Attala North Jafra, Qahar, Tabiyeh fields	NA
Do.	do.	Dijla Petroleum Co. [General Petroleum Corp. (GPC), 50%, and Gulfsands Petroleum, p.l.c., 50%]	Khurbet East field	NA
Do.	do.	Oudeh Petroleum Co. [General Petroleum Corp. (GPC), 50%, and China Petrochemical Corp. (Sinopec), 50%]	do.	NA
Do.	do.	Syria-Sino Al Kawkab Oil Co. [General Petroleum Corp. (GPC), 50%, and China Petrochemical Corp. (Sinopec), 50%]	Oudeh field	NA

See footnotes at end of table.

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TABLE 2—Continued
SYRIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum—Continued				
Crude—Continued	thousand 42-gallon barrels	Syrian Petroleum Co. (Government, 100%)	Jebissa, Karatchok, Rumailan, and Suwaydiyah fields	NA
Refined	do.	Banias Refinery Co. (Government, 100%)	Banias	48,545
Do.	do.	Homs Refinery Co. (Government, 100%)	Homs	39,055
Phosphate rock		General Company for Phosphate and Mines (GECOPHAM) (Government, 100%)	Alsharqiya (A and B Mines)	2,575
Do.		do.	Khunayfis	1,000
Phosphatic fertilizers		General Fertilizers Co. (Government, 100%)	Homs	450
Phosphoric acid		do.	do.	100
Salt		General Establishment of Geology and Mineral Resources (GEGMR) (Government, 100%)	Dayr az Zawr	72
Steel:				
Billet		General Company for Iron and Steel Products (Hadeed Hama) (Government, 100%)	Hama	70
Rolled		Al Wahib Group	Tartus	100
Do.		Arabian Steel Co. (ASCO)	Jableh	300
Do.		General Company for Iron and Steel Products (Hadeed Hama) (Government, 100%)	Hama	78
Do.		Hmisho Steel S.A.	Latakia	500
Do.		International Company for Steel Rolling	Hessya	300
Do.		Joudco Steel Ltd.	do.	150
Do.		Middle East Steel Industries	Yabroud	140
Do.		Orient Co.	Aleppo	NA
Do.		Syria Steel and Iron Co. (SALB)	Adra	NA
Sulfur	metric tons	Homs Refinery Co.	Homs	40,000
Do.	do.	do.	Processing plant at Suwaydiyah	NA
Do.	do.	Syrian Petroleum Co. (Government, 100%)	Processing plant at Jebissa	NA
Sulfuric acid		General Fertilizers Co. (Government, 100%)	Homs	406
Volcanic tuff		General Establishment of Geology and Mineral Resources (GEGMR) (Government, 100%)	Quarries at Daraa, Assowaida, Al Hasakah, and Arraqah	1,000

Do., do. Ditto. NA Not available.
[1]Subsidiary of the General Organization of Cement and Building Materials (GOCBM), which is 100% Government owned.
[2]Expressed in nitrogen equivalent.

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The Mineral Industry of the United Arab Emirates

By Waseem A. Abdulameer

In 2013, the United Arab Emirates (UAE)[1] continued to be a regional industrial center and a global trade and financial hub. Revenue from the country's large hydrocarbon sector was supplemented with revenue from downstream mineral industries. The UAE was the world's fifth-ranked producer of primary aluminum after China, Russia, Canada, and the United States, and it accounted for about 4% of the total global output. It was a major regional producer of industrial minerals and metals, including cement, iron and steel, nitrogen fertilizers, and sulfur. It was also one of the world's top crude oil producers in 2013, with an average daily production of 2.8 million barrels. The UAE ranked sixth in the world in terms of its crude oil reserves, which totaled about 98 billion barrels, or about 6% of the world's reserves. It ranked seventh in the world in terms of its natural gas reserves, which totaled about 6 trillion cubic meters; however, the country continued to be a net natural gas importer to meet its increasing domestic energy consumption. The UAE registered notable increases in the production of some mineral commodities and fuel minerals, including cement, iron and steel, liquefied petroleum gas (LPG), and nitrogen owing to the commissioning of new production lines, reaching full capacities at existing plants, and new merger agreements. Considerable progress was made in natural gas, nuclear energy, petroleum, renewable energy, and sulfur development projects (table 1; U.S. Energy Information Administration, 2013; Abu Dhabi National Oil Co., 2014, p. 13; BP p.l.c., 2014, p. 6, 8, 20, 22; Bray, 2014, p. 16–17; HSBC Global Connections, 2014; Organization of the Petroleum Exporting Countries, 2014, p. 31).

Government Policies and Programs

As of yearend 2013, the UAE did not have a specific, comprehensive Federal law covering the mining industry (DLA Piper, 2012, p. 85–86). The Abu Dhabi Emirate, which is the largest of the UAE's seven Emirates in terms of land area, controlled 94% of the UAE's national oil and gas reserves; the Dubai Emirate controlled 4% of the national oil and gas reserves, and the other five Emirates combined controlled the remaining 2%. Article 23 of the UAE Federal Constitution considers each Emirate to be responsible for managing its own natural resources, including oil and natural gas. The Supreme Petroleum Council (SPC) of the UAE regulates the extraction of oil and natural gas and sets the governing policies for oil and natural gas extraction in each Emirate. The Federal Ministry of Energy is responsible for determining the planning priorities; however, it has minimal governing authority (Phakey and Renouf, 2014).

The UAE continued to develop regulations for foreign investment by introducing a modified investment law. The new draft of the proposed Commercial Companies Law, which reached an advanced stage in 2013, includes provisions that postpone consideration of increased foreign ownership of UAE companies, confirms regulations currently in place for limited liability companies, and allows the Government to handle corporate violations at an earlier stage. The law is expected to provide a conducive environment for corporate regulation in the UAE when enacted in 2015 (Latham and Watkins, 2013, p. 1, 2; U.S. Department of State, 2014).

The government of Abu Dhabi continued implementing its "Economic Vision 2030" plan in 2013 by increasing its investments in infrastructure and energy. The Abu Dhabi government also encouraged the diversification of energy sources by incorporating renewable and nuclear energy projects in its short-term plans. Those plans were aimed at decreasing the Emirate's dependence on the petroleum sector (Government of Abu Dhabi, 2008, p. 1, 5, 23, 45, 78; Norman, 2013; HSBC Global Connections, 2014; MEED, 2014a).

Minerals in the National Economy

The UAE's gross domestic product (GDP) increased by 5.2% in real terms in 2013 compared with 4.7% in 2012. Despite the UAE Federal Government's diversification strategy, the hydrocarbon sector accounted for about 40% of the country's GDP in 2013, which was a 3% increase from that of 2012, and the nonhydrocarbon sector accounted for about 60% of the GDP. The mining and quarrying sector accounted for about 6% of the GDP; of this amount, the quarrying sector accounted for 11%, and the crude oil and natural gas sector, for 6%. In 2013, the mining sector (including hydrocarbons) employed about 69,000 people directly, and was indirectly responsible for the employment of about 178,000 people (World Travel and Tourism Council, 2013, p. 16; Bank Audi S.A.L., 2014, p. 3; NBD PJSC, 2014, p. 1–2; United Arab Emirates National Bureau of Statistics, 2014b).

Production

The most notable increases in production of industrial mineral commodities in 2013 compared with those of 2012 were for ammonia and urea, which doubled in output owing to Ruwais Fertilizer Industries' (FERTIL's) commissioning of a new production facility. The majority of the ammonia produced was used to produce urea. Despite the unchanged domestic demand for cement in 2013, the country's overall output of cement increased by 23% in response to declared infrastructure development projects by the Federal Government, expanded

[1]The United Arab Emirates is a federation of seven Emirates: Abu Dhabi, Ajman, Dubai (Dubayy), Fujairah (Al Fujayrah), Ras Al Khaimah, Sharjah (Ash Shariqah), and Umm al-Quwain (Umm Al Qaywayn).

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capacities, and increased exports to other member countries of the Gulf Cooperation Council (GCC). Output of mineral fuels and natural gas changed notably in 2013. LPG output increased substantially (by 78%) compared with that of 2012 owing to the completion of the Integrated Gas Development (IGD) project in Abu Dhabi, which was expected to position the UAE as one of the major LPG producers in the world by 2017. Production of residual fuels increased by 24%, and that of crude oil and condensate, by 8%, whereas production of distillate fuels decreased by 3.6% owing to a production halt during a refinery expansion project; production of natural gas also decreased slightly. Increases in production of metals included that of crude steel, by 19%; hot-rolled steel, by 18%; and direct-reduced iron (DRI), by 13%; production of aluminum also increased slightly (table 1; Platts, 2013).

Structure of the Mineral Industry

The Abu Dhabi Emirate makes up about 86% of the land area of the UAE; the Emirate controlled and managed the majority of the Nation's petroleum and natural gas resources through the wholly state-owned Abu Dhabi National Oil Co. (ADNOC) (United Arab Emirates Government, 2014). ADNOC operations were run through 16 subsidiaries that carried out most of the exploration, production, transportation, and marketing operations for crude oil, liquefied natural gas (LNG), LPG, petrochemicals, and other petroleum industries in the UAE. The Abu Dhabi Company for Onshore Oil Operations (ADCO) operated seven major onshore fields (Abu Al Bukhoosh, Arzanah, Asab, Bab, Bu Hasa, Jarn Yaphour, Sahil, and Shah fields). The Abu Dhabi Marine Operating Co. (ADMA-OPCO) operated two offshore fields (Umm Shaif and Zakum). The Zakum Development Co. (ZADCO) operated three offshore fields (Satah, Umm Al-Dalkh, and Upper Zakum).

Abu Dhabi Gas Industries Ltd. (GASCO) operated three plants for natural gas processing and natural gas liquids (NGL) extraction (Asab, Bu Hasa, and Habshan/Bab) as well as the NGL fractionation plant in Ruwais. The company also operated a pipeline distribution network to route natural gas to domestic industrial companies, including Emirates Aluminium Co. Ltd., and the local power stations. Abu Dhabi Oil Refining Co. (TAKREER), which operated the Ruwais and Umm Al Nar refineries, and National Gas Shipping Co. (NGSCO) also conducted oil processing. Abu Dhabi Gas Liquefaction Company Ltd. (ADGAS) operated an LNG plant on Das Island and carried out natural gas processing. ADNOC Linde Industrial Gases Co. (ELIXIER), which operated the Ruwais air separation plant and the Mirfa nitrogen plant, also carried out natural gas processing. The chemical and petrochemical manufacturing companies included Abu Dhabi Polymers Co. Ltd. (BOROUGE) and FERTIL. Supportive services were provided for exploration and production through National Drilling Co. (NDC), which conducted onshore and offshore drilling; Abu Dhabi Petroleum Ports Operating Co. (IRSHAD), which undertook marine operations of the Abu Dhabi petroleum ports; and the Mussafah Offshore Supply Base (ESNAAD), which provided facilities, services, and supplies (Abu Dhabi National Oil Co., 2014, p. 6–8).

Fujairah Natural Resources Corp. (FNRC) was the Government agency in charge of the development of mineral production in the Emirate of Fujairah, which is located in the northeastern part of the UAE. In 2012 (the latest year for which comprehensive data were available), the FNRC produced more than 77 million metric tons (Mt) of industrial mineral commodities and other building materials. The FNRC operated the Al Kaser Bay export terminal, which was inaugurated in October 2012. The terminal included two ports, each of which had a per-ship loading capacity 15,000 t and through which large-size stones were exported to other GCC countries for use in maritime pavement, backfill, and leveling projects (Fujairah Natural Resources Corp., 2013, 2015).

Emirates Global Aluminium (EGA) was a wholly state-owned company and the major aluminum producer in the UAE. It conducted its operations through its subsidiaries Dubai Aluminium Co. (DUBAL), which operated a smelter at Jebel Ali, and Emirates Aluminium Co. (EMAL), which operated a smelter at Taweelah (Emirates Global Aluminium, 2014).

Emirates Steel Industries, which was a subsidiary of SENAAT General Holding Corp., was the leading steel producer in the UAE. It conducted its operations at the integrated steel plant in the industrial city of Abu Dhabi (Emirates Global Aluminium, 2014; HSBC Global Connections, 2014; SENAAT General Holding Corp., 2014).

Mineral Trade

The total value of the UAE's foreign trade showed a minor increase in 2013 compared with that of 2012 (United Arab Emirates National Bureau of Statistics, 2014a, p. 6–10, 12). Asian countries accounted for about 43% of the total value of net foreign trade with the UAE, followed by the European Union, 23%, the Americas, 10%, and GCC countries, 9%. The UAE's trade value with the GCC countries increased notably (by 19%) in 2013 compared with that of 2012. The value of the UAE's imports increased by about 3% in 2013 compared with those of 2012 owing to the increase in trade of pearls and precious stones. In 2013, the UAE's non-oil exports decreased by about 13%, whereas exports of minerals and manufactured metals increased substantially (by 26%). The value of the country's reexports of manufactured goods increased by about 6% in 2013 compared with that of 2012 (United Arab Emirates National Bureau of Statistics, 2014a, p. 6–10, 12).

The UAE's leading exports market was Japan, which accounted for 14% of the country's total exports, followed by India, 11%, and Iran, 10%. The UAE's leading goods supplier was China, which accounted for 14% of the country's total imports, followed by India, 13%, and the United States, 10% (World Bank, The, 2014, p. 42, 51). The bilateral trade balance between the UAE and the United States was about $22.3 billion in 2013, which was an 8% increase compared with that of 2012. U.S. exports of goods to the UAE were valued at $24.6 billion in 2013, which was a 9% increase from that of 2012 (with machinery, gold, and metals topping the list) and made the UAE the 17th-ranked market for U.S. goods exports. U.S. imports from the UAE were valued at $2.3 billion in 2013, making the UAE the 65th-ranked goods exporter to the United States; aluminum, diamond, and fertilizers topped

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the list of U.S. imports from the UAE (Office of the U.S. Trade Representative, 2014; U.S. Census Bureau, 2014, 2015).

In 2013, the UAE imported 5.6 Mt of semifinished and finished steel products (down from 6.2 Mt in 2012 and 13.6 Mt in 2008), making it the world's sixth-ranked importer of these types of products. The country imported about 3.0 Mt of iron ore (which was a slight decrease from that of 2012), about 2.9 Mt of flat products (a 9% decrease from that of 2012), and about 1.9 Mt of long products (a 15% decrease from that of 2012). The UAE exported about 97,000 t of long products, which was a 149% increase compared with exports of that type in 2012, and 48,000 t of flat products, which was a 36% decrease compared with exports of that type in 2012 (World Steel Association, 2014a, p. 65, 67, 70, 72, 105; 2014b, p. 25).

The UAE did not produce any mined gold in 2013, although the country was a major global gold trade center. About 40% of the world's physical trade in gold came through Dubai. In 2013, Dubai's annual traded volume of gold was about 2,250 t valued at $75 billion, which as a 7% increase compared with that of 2012. India ranked first among Dubai's foreign gold-trading partners; the value of total bilateral trade between the two countries in 2013 was $30 billion (Consulate General of India-Dubai, 2014; UAEinteract, 2014; World Trade Organization, 2014, p. 26, 76).

The UAE did not produce any diamond in 2013; however, it was a major global diamond trading hub of both rough and polished diamond. Dubai increased its imports of rough diamond by about 11% in 2013 to 66,685 million carats from 59,744 million carats in 2012; it increased its exports of rough diamond by about 12% in terms of weight (6% in value) to 67,935 million carats from 60,446 million carats in 2012. The diamond trading partners of the UAE included Angola, Belgium, China, Hong Kong, India, South Africa, Switzerland, and the United Kingdom (Dubai Diamond Exchange, 2013; Israeli Diamond Industry, 2014; Kimberley Process, 2015).

Commodity Review

Metals

Aluminum.—In 2013, the UAE produced about 1.9 Mt of aluminum, which was slightly more than in 2012. EGA was a 50–50 joint-venture company held by Mubadala Development Co. of Abu Dhabi and Investment Corp. of Dubai. EGA was formed through a $15 billion merger agreement between DUBAL and EMAL. EGA owned DUBAL's and EMAL's existing smelters in Jebel Ali and Taweelah, respectively. Following the completion of the second phase of EMAL's $8 billion smelter expansion in mid-2014, EGA's combined production capacity was expected to reach 2.4 million metric tons per year (Mt/yr) by yearend 2014, which would make the UAE the world's fourth-ranked producer of aluminum. The upgraded capacity was projected to enable the EGA to have a combined portfolio that would consist of remelt ingot, high-purity aluminum, and billet. The EGA planned to export 90% of its production mainly to consumers in Asia and in the Middle East and North Africa regions. The EGA continued to secure raw materials for its production plants in the UAE in 2013. The company owned Guinea Alumina Corp. (GAC), which had been established to develop an alumina refinery and associated bauxite mine in Guinea. GAC had allocated $5 billion to the project, including $1 billion to extract and export bauxite to the UAE and $4 billion to construct an aluminum refinery and a port. The bauxite facility was expected to start exporting by 2017, and the 2.0-Mt/yr-capacity aluminum refinery was expected to be in operation by 2022 (Carvalho and Doherty, 2013; Emirates Global Aluminium, 2014; HSBC Global Connections, 2014).

Antimony.—In 2013, Tri-Star Union FZ LLC, which was a joint venture of Tristar Resources p.l.c. of the United Kingdom and the Union International Holdings Group of the UAE, stopped its previous plans to construct an antimony plant at the Al Ghail Industrial Zone in Ras Al Khaimah Emirate. Instead, the company signed a memorandum of understanding with the Oman Investment Fund and Castell Investments of Oman in October to create a new joint venture and prepare an estimated timeline to construct the facility and plant in the Sultanate of Oman (Tristar Resources p.l.c., 2014).

Gold.—In 2013, the Kaloti Jewellery Group, which was considered one of the world's leading producers of refined gold, operated one of the largest gold refineries in the UAE; the refinery was located in Sharjah Emirate and had the capacity to produce 300 metric tons per year (t/yr) of refined gold. The construction of a new $60 million gold and silver refinery project by the Kaloti Jewellery Group continued in the outskirts of Dubai. The project, which was expected to increase the UAE's silver refining capacity to 600 t/yr from 100 t/yr, was also projected to increase the country's gold-refining capacity to 1,440 t/yr from 800 t/yr when commissioned in 2015 (Gulf News, 2014; Kaloti Jewellery Group, 2015).

Iron and Steel.—Emirates Steel Industries P.J.S.C. (a subsidiary of SENAAT General Holdings Corp.) had the only integrated steel plant in the UAE. The company was expected to continue leading upstream steel development in the UAE during the next few years. The company's production capacity was 3.5 Mt/yr of steel billet in 2013 and was expected to reach about 5.5 Mt/yr within the next 3 years. The third phase of the Emirates Steel Industries expansion project at the new Khalifa Industrial Zone (Kizad) was projected to add about 1.6 Mt/yr to the company's capacity when commissioned in mid-2014. This phase of the project was expected to include a new DRI plant, a melt shop, and a continuous rolling mill (SENAAT General Holding Corp., 2014; Steel Times International, 2014).

United Iron and Steel Co. was projected to start construction work on a new $138 million steel rolling mill at the Mussafah Industrial Area in Abu Dhabi in 2014. The mill, which was projected to start commercial production by 2016, would produce galvanized steel coil used in building applications. The mill would have an initial capacity of 0.3 Mt/yr; the capacity was planned to be increased to 0.5 Mt/yr at a later time (HSBC Global Connections, 2014; Watts, 2014).

Industrial Minerals

Cement.—In 2013, the UAE consumed 8 Mt of cement domestically. The sector continued to increase its capacity to

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reach production of 60% more than domestic consumption, with the aim of exporting the remainder of its production to the other GCC countries, which had collectively the highest cement consumption rate in the world at about 1,950 kilograms per capita. The UAE's cement production capacity was 24 Mt/yr, which was about 33% of the GCC total in 2013, and the UAE's estimated production in 2013 was about 21 Mt. More than 22 companies in the UAE traded in cement in 2013; about 9 of those companies produced cement (Karmani, 2014, p. 4, 9, 13, 32–33).

Gulf Cement Co. in Ras Al Khaimah had the capacity to produce 2.7 Mt/yr of cement, and the company supplied a number of the development and infrastructure projects in the country, including the Dubai Airport expansion and the Burg Khalifa project. Union Cement Co. P.S.C. at the Khor Khuwair Industrial Area in Ras Al Khaimah Emirate had the capacity to produce 4.8 Mt/yr of cement; it used local limestone, shale, and silica to produce different grades of sulfate-resistant cement, in addition to portland cement. Arkan Building Materials Co. (ARKAN) P.J.S.C., which was 51% owned by SENAAT General Holding Corp., operated the Emirates cement factory at the Al Ain Industrial Area in Abu Dhabi Emirate; the cement factory had the capacity to produce about 1.1 Mt/yr of cement. The company was constructing a new $354 million cement plant that was planned to have the capacity to produce 4.5 Mt/yr of cement, which would increase the company's cement production capacity to 5.6 Mt/yr. The plant was expected to begin production by yearend 2014 (Global Cement Co., 2014; Gulf Cement Co., 2014; Union Cement Co. P.S.C., 2014; World Cement, 2014).

Lime.—The Ras Al Khaimah Co. for White Cement and Construction Materials PSC, which was a major UAE lime-producing company in the Ras Al Khaimah Emirate, increased its production slightly to 346,000 t of lime in 2013 from 340,000 t in 2012. The company used raw limestone that was supplied from deposits near the Hajar Mountains of Ras Al Khaimah. The Emirate lime factory, which was owned by the Al Jazeera Emirates Group, was based in Abu Dhabi Emirate and had a capacity of 1,000 metric tons per day (t/d) of lime. The factory produced calcium carbonate, hydrated lime powder, dolomite powder, quick lime powder, and quick lime lumps (Global Manufacturers, 2014; Ras Al Khaimah Co. for White Cement and Construction Materials PSC, 2014; Emirates Lime Factory, 2015).

Nitrogen.—FERTIL, which was the major nitrogen fertilizer producer in the UAE, was a joint venture between ADNOC (66%) and Total S.A. of France (33%). FERTIL operated two ammonia plants and two urea plants in the Ruwais Industrial Complex. In July 2013, the company commissioned the expansion of the FERTIL 2 project, which was carried out by Samsung Engineering and Construction Co. Ltd. of the Republic of Korea, and increased the production of ammonia by about 0.6 Mt/yr and urea by about 1.3 Mt/yr. FERTIL had a capacity of 1.2 Mt/yr of ammonia and 2.1 Mt/yr of urea by late 2013 (Abu Dhabi National Oil Co., 2014, p. 8, 13; Chemicals Technology; 2014; MEED, 2014b).

FERTIL sold about 96% of its ammonia production domestically and exported the remainder to consumers in Saudi Arabia and South Africa. FERTIL exported the majority of its urea production to foreign consumers, including Brazil (20%), Pakistan (16%), and the United States (28%), and the remainder went to domestic industries (Arab Fertilizers Association, 2014, p. 15–16, 27, 30, 32, 35).

Sulfur.—The UAE produced 1.9 Mt of sulfur in 2013 and accounted for 27% of total sulfur production in GCC countries. The commissioning of GASCO's Habshan 5 project by yearend 2013 and the Al Hosn Gas's new Shah sour gas project, which is located 210 km southwest Abu Dhabi, by yearend 2014 was expected to triple the UAE's sulfur supply in 2015. Al Hosn Gas was a joint venture between ADNOC (60%) and Occidental Petroleum Corp. of the United States (40%). The construction of the 120-kilometer (km) sulfur transportation railway between the Shah field and the Ruwais terminal continued; the section between the Habshan field and the Ruwais terminal was undergoing testing in late 2013 (Messick, 2013; Abu Dhabi National Oil Co., 2014, p. 13; Arab Fertilizers Association, 2014, p. 11, 21, 24, 63).

Mineral Fuels and Other Sources of Energy

Natural Gas.—ADNOC completed the IGD project in the third quarter of 2013. The project included the construction of new onshore and offshore gas processing plants at the Habshan field and at Ruwais in Abu Dhabi. The $7 billion natural gas project was implemented by ADGAS, ADMA–OPCO, and GASCO and was planned to process the natural gas received from the Umm Shaif field at the Habshan and the Ruwais facilities to produce a combined 22.6 million cubic meters per day of natural gas for domestic consumption (Abu Dhabi National Oil Co., 2014, p. 10).

Al Hosn Gas's Shah gas development project was planned to extract and process 28.3 million cubic meters per day of wet natural gas, which contained about 23% hydrogen sulfide, from the Shah sour gas reservoir, and to produce 14.2 million cubic meters per day of natural gas. The $10 billion project was expected to be completed by the beginning of 2015 and was considered to be a vital energy infrastructure project for the UAE (Abu Dhabi National Oil Co., 2014, p. 10; Saadi, 2014).

Nuclear Energy.—Electricity use in the UAE increased by 9% in 2013 compared with that of 2012 owing to the increase in domestic power consumption led by new projects in the petroleum and natural gas sector and downstream industries. In 2012 (the latest year for which data were available), the country met about 98% of its electricity needs through local natural gas powerplants. Those plants continued to consume the majority of the domestic natural gas production and led the country to continue to import natural gas as LNG by pipelines from neighboring Qatar, as it had done since 2007 (HSBC Global Connections, 2014; World Nuclear Association, 2014).

In 2013, the UAE continued with construction of the four-unit (Barakah 1, Barakah 2, Barakah 3, and Barakah 4) nuclear powerplant. Each unit would have 1,400 megawatts (MW) of electricity generating capacity by 2020. Emirates Nuclear Energy Corp. (ENEC) completed the installation of the contaminant liner plate at the Barakah 1 reactor building in late 2013. The first phase of the Barakah 1 project, which was being carried out by Hyundai Engineering and Construction Company Ltd. of the Republic of Korea, was scheduled to be

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more than 50% completed by the third quarter of 2014 and to begin commercial production by 2017. ENEC was on schedule with the second phase of the project, Barakah 2, which was being carried out by Samsung C&T Corp. of the Republic of Korea. Samsung started the construction work on this phase of the project around May 2013; the plant was expected to start operations by 2018 (Emirates Nuclear Energy Corp., 2013; World Nuclear Association, 2014).

Petroleum.—In 2013, ADNOC produced crude oil from onshore fields, including the Murban field, and from offshore fields, including the Lower Zakum, the Umm Shaif, and the Upper Zakum fields. ADNOC planned to produce a new crude stream called Das, which was expected to be a blend of light and sweet crude, from the two existing streams of the Lower Zakum and the Umm Shaif fields by the third quarter of 2014 (Abu Dhabi National Oil Co., 2014, p. 12).

The UAE continued to develop existing petroleum fields by incorporating new technologies, including enhanced oil recovery technologies. The Upper Zakum offshore field development project was set up on four artificial islands using enhanced oil recovery methods and was projected to be sustainable for 25 years. In 2013, the project, which was managed by ZADCO [a consortium of ADNOC (60%), ExxonMobil Oil Co. of the United States (28%) and Japan Oil Development Co. (JODCO) of Japan (12%)], was expected to increase the field's output to 750,000 barrels per day (bbl/d) by 2017 from the current 550,000 bbl/d. The Lower Zakum field, which was operated by ADMA–OPCO, was also expected to increase its output to 425,000 bbl/d by 2020 from the current 300,000 bbl/d (U.S. Energy Information Administration, 2013; Abu Dhabi National Oil Co., 2014, p. 11).

In 2013, ADCO continued to implement its onshore Sahil-Asab-Shah full-field development project, which was expected to increase its crude oil production to 1.8 million barrels per day by 2017. The expansion was conducted by constructing new facilities and adding a crude oil field in Qusahwira. The field, which was commissioned in late 2013, had an initial capacity of 30,000 bbl/d; the capacity was projected to be increased to 53,000 bbl/d by 2017 (Abu Dhabi National Oil Co., 2014, p. 11).

The UAE had five refining facilities in 2013. The largest was at Ruwais and was operated by TAKREER, which was a wholly owned subsidiary of ADNOC; the Ruwais facility had the capacity to produce 400,000 bbl/d of crude oil. The Ruwais refinery was about to go through a $10 billion expansion that would add 417,000 bbl/d of crude oil refining capacity, bringing the overall capacity to 800,000 bbl/d by mid-2014. Plans were in place to expand the storage capability of the Al Fujairah export terminal substantially in the next 3 years by adding three subsea loading lines, an intermediate pumping station, and three offshore buoys designed for deepwater tanker loading (U.S. Energy Information Administration, 2013; Abu Dhabi National Oil Co., 2014, p. 8, 12; Oil and Gas Journal, 2014).

In 2013, a joint venture of ADNOC (51%) and Abu Dhabi Future Energy Co. (MASDAR) (49%) initiated the development of a three-component carbon capture, use, and storage facility that would have the capacity to sequester 800,000 t/d of carbon dioxide (CO_2). The contract to build the $122.5 million project was awarded to the Dodsal Engineering and Construction Group of India. The project was designed to capture CO_2 at the source at the Emirates Steel Industries (ESI) mill at Mussafah and then compress and transport the CO_2 through a 50-km pipeline to ADNOC's onshore oilfields where it would be reinjected into the oilfields to enhance oil recovery rates. The facility was expected to be inaugurated by 2016 (Abu Dhabi National Oil Co., 2014, p. 11; Global CCS Institute, 2014).

Renewable Energy.—The Abu Dhabi government created additional investment opportunities in multiple industrial sectors to help reach its goal of generating 7% of Abu Dhabi's electricity from renewable resources by 2020. The Dubai government announced plans to generate 5% of its electricity from renewable sources, including solar and nuclear, by 2030. MASDAR, which was wholly owned by Mubadala Development Co., acquired the 100-MW photovoltaic (PV) project in late 2013. The Noor-1 project would use the PV panels located at the Al-Aflaj area east of Al Ain city to convert sunlight into electricity directly. This approach would be different from that used at the Shams-1 solar powerplant (a 100-MW solar thermal project that was commissioned in 2012), which used concentrated solar power to generate electricity from the heat of the sun. The Noor-1 project was expected to include two PV subfields. The first subfield would be made up of about 50 MW of crystalline PV modules, and the second subfield would be made up of about 50 MW of thin-film modules and cover an area of about 3 square kilometers (Norman, 2013; Government of Abu Dhabi, Regulation and Supervision Bureau, 2014; Wilkinson, 2014).

Outlook

The UAE's economy is expected to grow at a rate of 5% in 2014; the growth is expected to be driven by increased production by the nonhydrocarbon sector. The UAE Government's large investments in the infrastructure and energy sectors are projected to stimulate further economic growth within the next few years, and the industrial and trade sectors are expected to play a significant role in stabilizing the country's economy during this period. The government of Abu Dhabi is expected to fund $337 billion worth of development projects in various sectors between 2013 and 2030. Those projects are expected to diversify Abu Dhabi's economy and reduce its dependence on petroleum resources in the long run (Government of Abu Dhabi, 2008, p. 1, 5, 23, 45, 78; Blake, Cassels & Graydon LLP, 2014, p. 12; International Monetary Fund, 2014, p. 6; MEED, 2014a).

The projected increase in the UAE's sulfur production resulting from the inauguration of the Shah sour gas project within the next 3 years could make the country one of the major sulfur producers in the world. The upstream development projects by ADNOC and its subsidiaries, such as the Upper Zakum full-field development, and by Al Hosn Gas are expected to sustain the UAE's role in the global hydrocarbon sector. The Barakah nuclear power project and the Noor-1 solar power project are expected to play critical roles in the diversification of the country's energy sources and support the Federal Government's objective to decrease the country's dependence on petroleum and natural gas within the next 5 years (CNBC Arabia, 2014; LPG World Forum, 2014).

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TABLE 1
UNITED ARAB EMIRATES: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
METALS						
Aluminum, primary		955	1,400	1,800	1,820	1,864
Chromite ore		24	25 r	--	--	--
Iron and steel:						
Direct-reduced iron		--	1,180	2,250	2,720	3,075
Steel, crude		100	500	2,000	2,408	2,878
Hot-rolled long products		1,170	1,580	1,950	2,156	2,549
Concrete-reinforcing bars		--	--	--	1,586	1,662
INDUSTRIAL MINERALS						
Cement, hydraulic		18,997	18,000	18,000	17,000	21,000 e
Gypsum e		760	720	720	680	700 e
Lime		147	174	340	400	450 e
Nitrogen:						
N content of ammonia		380	392	386	330	658
N content of urea		284	310	324	289	618
Sulfur[3]		2,175	1,829	1,885	1,900	1,900
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	75,840	79,778	82,433	85,613	83,796
Dry	do.	48,800	51,300	52,300	54,308	56,000
Natural gas plant liquids	thousand 42-gallon barrels	91,250	98,550	146,000	146,000	145,000 e
Petroleum:						
Crude and condensate	do.	1,003,750	1,046,455	1,212,530	1,233,700	1,330,790
Refinery products:						
Liquefied petroleum gas	do.	5,840	6,570	8,103	6,606	11,791
Gasoline	do.	12,994 r	15,731 r	20,914 r	23,834 r	26,024
Kerosene and jet fuel	do.	35,405 r	37,120 r	49,202 r	53,947 r	55,042
Distillate fuels	do.	26,681 r	29,017 r	36,427 r	31,317 r	30,185
Residual fuels	do.	5,584 r	5,803 r	6,679 r	5,767 r	7,154
Other	do.	34,273 r	42,048 r	49,640 r	50,990 r	42,997
Total	do.	120,777 r	136,289 r	170,965 r	172,461 r	173,193

eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. rRevised. do. Ditto. -- Zero.

[1]Table includes data available through December 9, 2014.

[2]In addition to the commodities listed, industrial minerals, such as common clays, crushed stone, diabase, gravel, limestone, marble, sand, salt, and shale presumably are produced, but output is not reported, and available information is inadequate to make reliable estimates of output.

[3]Byproduct of petroleum refining and natural gas processing.

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TABLE 2
UNITED ARAB EMIRATES: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum		Emirates Global Aluminium (EGA) [Mubadala Development Co. of Abu Dhabi, 50%, and Investment Corp. of Dubai (Government of Dubai, 100%), 50%]	Jebel Ali and Taweelah	950
Do.		do.	Khalifa Port and Industrial Zone, Abu Dhabi	800
Cement:				
Portland		Aditya Birla Star Cement (Aditya Birla, 80%, and private, 20%)	Grinding plant at Abu Dhabi	1,100
Do.		do.	Grinding plant at Ajman	1,000
Do.		do.	Clinker plant at Ras Al Khaimah	2,200
Do.		Al Ain Cement Factory (SENAAT General Holding Corp.)	Al-Ain	3,400
Do.		Arabian Gulf Cement Company LLC	Ajman	1,100
Do.		Arkan Building Materials Co. (ARKAN) P.J.S.C. (SENAAT General Holding Corp., 51%)	Al-Ain	1,300
Do.		Binani Cement Factory LLC	Grinding plant at Jabal Ali	2,000
Do.		Bin Hamel Nael Cement Co.	Grinding plant at Al-Ain	500
Do.		Cemex Falcon LLC	Grinding plant at Dubai	1,600
Do.		Emirates Cement Factory (SENAAT General Holding Corp.)	Abu Dhabi	2,300
Do.		Fujairah Cement Industries P.S.C.	Dibba, Fujairah	2,800
Do.		Gulf Cement Co. (National Investment Co., 35.75%; Ras Al Khaimah government, 7.67%; individual investors, 56.58%)	Khor Khuwair, Ras Al Khaimah	2,700
Do.		Hamriyah Cement Co. FZC (Bin Kamil Investment Group)	Grinding plant at Sharjah	1,000
Do.		Jebel Ali Cement Co. (Sharaf Industries, 100%)	Jebel Ali, Dubai	840
Do.		KCC Co. LLC	Grinding plant at Sharjah	500
Do.		Lafarge Emirates Cement L.L.C. (Lafarge S.A., 50%, and private, 50%)	Fujairah	3,000
Do.		National Cement Company P.S.C. (Holcim Ltd.)	Sharjah	2,200
Do.		Pioneer Cement Industries LLC (Raysut)	Ras Al Khaimah	1,200
Do.		Ras Al Khaimah Cement Co. P.S.C.	Khor Khuwair, Ras Al Khaimah	1,000
Do.		Sharjah Cement and Industrial Development Co. (private, 70%, and government of Sharjah, 30%)	Sharjah	3,500
Do.		Teba Cement Co.	Grinding plant at Abu Dhabi	1,100
Do.		Umm al-Qaywayn Cement Industries Co. P.S.C.	Umm al-Quwain	1,600
Do.		Union Cement Co. P.S.C. (Ras Al Khaimah government, 41%, and Abu Dhabi Investment Authority, 20%)	Khor Khuwair, Ras Al Khaimah	4,800
White		Ras Al Khaimah Company for White Cement and Construction Materials	Ras Al Khaimah	450
Clay		Fujairah Natural Resources Corp. (FNRC)	Fujairah	2,000
Gold, refined	metric tons	Al Etihad Gold L.L.C.	Al Quoz, Dubai	200
Do.	do.	Al Etihad Gold Refinery DMCC	Jumeirah Lake Towers, Dubai	200
Do.	do.	Al Ghaith Gold (private, 100%)	Dubai	100
Do.	do.	Al Ghurair Giga Gold (private, 100%)	do.	100
Do.	do.	ARY Aurum Plus (private, 100%)	Sharjah	25
Do.	do.	Emirates Gold (private, 100%)	Dubai	200
Do.	do.	Kaloti Jewellery Group	Sharjah	300
Iron and steel:				
Iron, direct-reduced		Emirates Steel Industries P.J.S.C. (SENAAT General Holding Corp., 100%)	Abu Dhabi	3,000
Do.		Al Nasser Industrial Enterprises LLC	do.	250
Steel:				
Billet		Emirates Steel Industries P.J.S.C. (SENAAT General Holding Corp., 100%)	do.	3,500
Do.		Al Nasser Industrial Enterprises LLC	do.	220
Wire rod		Emirates Steel Industries P.J.S.C. (SENAAT General Holding Corp., 100%)	do.	480
Rebar		do.	do.	620
Do.		Alam Steel	Dubai	500
Do.		Al Nasser Industrial Enterprises LLC	Abu Dhabi	90

See footnotes at end of table.

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TABLE 2—Continued
UNITED ARAB EMIRATES: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Iron and steel—Continued:				
Steel—Continued:				
Rebar—Continued		Essar Steel Middle East PZE	Dubai	1,000
Do.		Hamriyah Steel FZC (Metalloinvest, 80%, and Sheikh Sultan Bin Khalifa Al Nahyan, 20%)	do.	1,000
Do.		Union Iron & Steel Company LLC	Abu Dhabi	500
Do.		Conares Metal Supply Ltd.	Dubai	400
Do.		Star Steel International LLC	Jebel Ali, Dubai; Hamriyah Free Zone, Sharjah	360
Do.		Al Ghurair Iron and Steel Co.	Abu Dhabi	350
Lime		Emirates Lime factory (Al Jazeera Industrial Group)	do.	350
Do.		Ras Al Khaimah Lime Co. (Ras Al Khaimah Co. for White Cement and Construction Materials PSC)	Ras Al Khaimah	350
Natural gas, liquefied		Abu Dhabi Gas Liquefaction Co. Ltd. (ADGAS) [Abu Dhabi National Oil Co. (ADNOC), 70%; BP p.l.c., 10%; Mitsu $ Co. Ltd.,15%; Total S.A., 5%]	Das Island	8,000
Nitrogen:				
Ammonia		Ruwais Fertilizer Industries (FERTIL) (Abu Dhabi National Oil Co. (ADNOC), 66.66%, and Total S.A., 33.33%)	Ruwais, Abu Dhabi	1,200
Urea		do.	do.	2,100
Petroleum:				
Crude	thousand 42-gallon barrels per day	Abu Dhabi Company for Onshore Oil Operations (ADCO) [Abu Dhabi National Oil Co. (ADNOC), 60%; BP p.l.c., 9.5%; Exxon Mobil Corp., 9.5%; Royal Dutch Shell Group, 9.5%; Total S.A., 9.5%; Participations and Explorations Corp., 2%]	Onshore Abu Dhabi oilfields, including the Asab, the Abu Al Bukhoosh, the Arzanah, the Bab, the Bu Hasa, the Jarn Yaphour, the Sahil, and the Shah fields	1,300
Do.	do.	Abu Dhabi Marine Operating Co. (ADMA-OPCO) [Abu Dhabi National Oil Co. (ADNOC), 60%; BP p.l.c., 14.67%; Total S.A., 13.33%; Japan Oil Development Corp., 12%]	Offshore Abu Dhabi oilfields, including the Umm Sharif and the Zakum fields	600
Do.	do.	Zakum Development Co. (ZADCO) [Abu Dhabi National Oil Co. (ADNOC), 63.36%; ExxonMobil Abu Dhabi Offshore Petroleum Company Ltd., 24.64%; Japan Oil Development Corp., 12%]	Offshore Abu Dhabi oilfields, including the Satah, the Umm Al-Dalkh, and the Upper Zakum fields	518
Do.	do.	Dubai Petroleum Establishment (Government of Dubai, 100%)	Dubai oilfields, including the Margham, the Falah, the Fateh, the Rashid, and the S.W. Fateh fields	100
Do.	do.	BP p.l.c. and Crescent Petroleum Company Inc.	Sharjah oilfields, including the Kahaif, the Saja, the Moveyid, and the Mubarek fields	50
Refinery products	do.	Abu Dhabi Oil Refining Co. (TAKREER) [Abu Dhabi National Oil Co. (ADNOC), 100%]	Ruwais refinery, Ruwais, Abu Dhabi	120
Do.	do.	do.	Umm Al Nar refinery, Abu Dhabi	85
Do.	do.	ENOC Processing Company LCC (EPCL) [Investment Corp. of Dubai (Government of Dubai, 100%) 100%]	Jebel Ali refinery, Jebel Ali, Dubai	120
Do.	do.	Sharjah Oil Refining Co. F.Z.C. (FAL Group, 100%)	Hamriyah Free Trade Zone, Sharjah	71
Do.	do.	Metro Oil Corp.	Fujairah	90
Salt		Alghaith Industries (Al Ghaith Holding PJSC)	Mussafah, Abu Dhabi	110
Sand		Fujairah Natural Resources Corp. (FNRC)	Fujairah	20,000
Silica, glass		Emirates Float Glass LLC (Dubai Investment PJSC, 100%)	Industrial City 1 and 2, Abu Dhabi	440
Do.		Guardian Zoujaj International Float Glass Co. LLC (Guardian RAK)	Ras Al Khaimah	255
Silver, refined	metric tons	Emirates Gold (private, 100%)	Dubai	100
Sulfur		Abu Dhabi National Oil Co. (ADNOC)	Abu Dhabi	2,000

Do., do. Ditto.

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The Mineral Industry of Yemen

By Mowafa Taib

Yemen's contribution to the world supply of minerals was limited to crude oil and liquefied natural gas (LNG) and to small quantities of dimension stone, gypsum, refined petroleum products, and salt. At the end of 2013, the country's proved reserves of crude oil and natural gas were estimated to be 3.0 billion barrels and 479 billion cubic meters, respectively. The country has abundant mineral resources that were not yet being developed. They include metals, such as cobalt, copper, gold, iron ore, nickel, niobium, platinum-group metals (PGMs), silver, tantalum, and zinc, and industrial minerals, such as black sands (which may contain ilmenite, monazite, rutile, and zirconium), celestine, clays, dimension stone, dolomite, feldspar, fluorite, gypsum, limestone, magnesite, perlite, pure limestone, quartz, salt, sandstone, scoria, talc, and zeolites (BP p.l.c., 2014, p. 6, 20; Yemen Geological Survey and Mineral Resources Board, 2014b–e).

Minerals in the National Economy

According to the International Monetary Fund (IMF), Yemen's gross domestic product (GDP) increased by 4.8% in real terms in 2013 compared with an increase of 2.4% in 2012 and a decrease of 12.7% in 2011. The IMF projected that the country's GDP would increase by 1.9% in 2014. Economic activity in the hydrocarbon sector, which included production of crude oil, LNG, and refined petroleum products, accounted for 98% of Yemen's mineral sector activity, and mining and quarrying activities accounted for only 2%. Hydrocarbon exports accounted for 85% of the value of Yemen's exports, provided 51% of Government revenue, and contributed 15.5% of the country's GDP (Central Bank of Yemen, 2014, p. 13; International Monetary Fund, 2014, p. 204).

In 2013, the value of Yemen's exports was about $7.8 billion, which was slightly more than that of 2012 but 14% less than that of 2011. Eighty-five percent of Yemen's LNG exports went to Asia, 14% to the Americas (including the United States), and 1% to Europe. The volume of Yemen's crude oil exports decreased to 124,000 barrels per day (bbl/d) from a peak of 350,000 bbl/d in 2003. The value of Yemen's imports decreased to about $10.8 billion in 2013 from $11.4 billion in 2012 (Central Bank of Yemen, 2014, p. 12; U.S. Energy Information Administration, 2014).

The value of U.S. exports to Yemen increased to $516 million in 2013 from about $469 million in 2012. The value of U.S. imports from Yemen, however, decreased to about $66 million in 2013 from $87 million in 2012 and $562 million in 2011. The decrease was attributable to a sharp decrease in U.S. imports of LNG, which amounted to 300 million cubic meters and accounted for 96% of the value of the total U.S. imports from Yemen. The value of U.S. imports of LNG from Yemen decreased to $63 million in 2013 from $84 million in 2012 and $297 million in 2011 (U.S. Census Bureau, 2014).

Government Policies and Programs

The Ministry of Oil and Minerals (MOM) had been actively promoting investment opportunities in the country's hydrocarbon, industrial mineral, and metal resource sectors. The MOM had been facilitating foreign investment in the country's mineral sector by adopting mining laws that adhere to international industry standards. Yemen General Corporation for Oil, Gas and Mineral Resources is the national oil company that directs several state-owned subsidiaries that are in charge of day-to-day operations. The Petroleum Exploration and Production Authority (PEPA) is the Government unit that represents the MOM's interest in oil exploration and production and manages licensing rounds and contracts with international oil companies. The Yemen Geological Survey and Mineral Resources Board (YGSMRB) is the state agency responsible for mineral production under the MOM; the agency provides chemical analyses, drilling, geophysical and geotechnical services, geologic maps, geo-environmental studies, information on mineral reserves and mineral occurrences in the country, and remote sensing studies (Yemen Geological Survey and Mineral Resources Board, 2014a).

The Government's industrial minerals development plan, which was announced in 2008, includes the development of an industrial city, an industrial minerals export port, a railway to transport industrial minerals to the export port, and a vocational training center. The YGSMRB has been focusing on the development of the country's industrial mineral resources, which are spread throughout the country in large deposits estimated to contain billions of metric tons of dolomite, feldspar, gypsum, limestone, pumice, sandstone, and scoria. Other industrial mineral deposits were estimated to contain hundreds of millions of metric tons of basalt, black sands (which may contain ilmenite, monazite, rutile, and zirconium), clays, magnesite, marble, perlite, rock salt, volcanic tuff, and zeolites. Additionally, the country hosts, in decreasing order, an estimated 34 million metric tons (Mt) of quartz, 1.4 Mt of kaolin, 1.1 Mt of fluorite, and substantial but still undetermined resources of talc (Assabri, 2012, p. 45; Yemen Geological Survey and Mineral Resources Board, 2014a, b).

Production

In 2013, marketed natural gas production (which was mainly exported as LNG) was reported to have increased by 37% to 10.3 billion cubic meters from 7.6 billion cubic meters in 2012. The significant increase in LNG production was attributed to uninterrupted operations, despite several attacks by rebel groups, throughout 2013 compared with the previous year. In 2012, the pipeline that carried natural gas from Block 18 to the Balhaf LNG export terminal was attacked by rebels, and the flow of natural gas was stopped for more than 6 months. Petroleum

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production, on the other hand, decreased by about 12% to 161,000 bbl/d in 2013 from 180,000 bbl/d in 2012, which, in turn, was a decrease of about 38% from the average production of 291,000 bbl/d in 2010. The decrease in crude oil production was in line with the general downward trend in production since 2001 but was also partly attributable to the 15 attacks in 2012 and the more than 9 attacks in 2013 on the country's crude oil pipelines, which disrupted production and exports in both years. The estimates for industrial mineral commodity output in table 1 are based on reported data from 2009, which is the latest year for which reported data were available (table 1; BP p.l.c., 2014, p. 8, 22; U.S. Energy Information Administration, 2014).

Structure of the Mineral Industry

Article 8 of Yemen's Constitution gives the Government ownership of the country's mineral and energy resources. Metallic and industrial mineral exploration and production operations are governed by law No. 22 of 2010 Concerning Mining and Quarries, which is known as the Mines and Quarries Law. The Mines and Quarries Law, which was approved by the Government in 2010 and by the Parliament on December 16, 2011, regulates prospecting, exploration, and mining operations as well as artisanal mining. The law sets royalty rates based on the type of mineral commodity and the gross value of production. The royalty rate for precious and semiprecious stones is set at 8% of the gross value of production; nonmetallic minerals, 5%; and metallic minerals, 3%. The law also imposes a 35% income tax on remitted dividends and grants an exemption on import duties during mine construction. Under the new law, a prospecting permit is granted for a period of 1 year for an area of up to 10,000 square kilometers (km^2), and an exploration permit is granted for an area of up to 1,000 km^2 for a period of 4 years; both types of permits can be renewed twice; that is, for two additional 4-year periods. Mining permits are issued for a 25-year period and can be renewed indefinitely in 10-year increments. Quarrying permits are issued for a 10-year period for areas of between 0.5 and 2 km^2 and can be extended indefinitely in 10-year increments. Artisanal mining permits are issued for a period of 2 years for areas up to 1 km^2 and can be renewed indefinitely for periods of 1 year at a time (Arab Industrial Development and Mining Organization, 2012, p. 242).

According to the YGSMRB, a number of mining companies had renewed their mining permits in Yemen in 2013. The companies included Ansan Wikfs (Hadramaut) Ltd. of the United Kingdom, Cantex Mine Development Corp. of Canada, Jabal Salab Co. (Yemen) Ltd. of the Cayman Islands, Stone Resources (Yemen) Ltd. of China, Thani Dubai Mining Ltd. of the United Arab Emirates, and Yemen Iron Steel Ltd. (Yemen Geological Survey and Mineral Resources Board, 2014d).

Commodity Review

Metals

Cobalt, Copper, Nickel, and Platinum-Group Metals.—Cantex was exploring for cobalt, copper, nickel, and PGMs at three locations in northeastern Yemen. These locations were the Al Masna'a, the Suwar, and the Wadi Qutabah properties. The Al Masna'a project is located in the Saadah region about 205 kilometers (km) northwest of Sana'a, and 25 km south of Yemen's border with Saudi Arabia. Cantex planned to resume exploration at the Al Masna'a area as soon as the security situation in the permit area improves but decided not to renew its exploration license at the Suwar and the Wadi Qutabah properties as of June 2013 (Cantex Mine Development Corp., 2013a).

Gold.—The YGSMRB listed 17 locations in Yemen that were open for foreign investment. In 2011, Cantex signed an option agreement with WCP Resources Ltd. (WCP) of Australia that would enable WCP to earn up to 70% interest in the Al Hariqah gold project by funding the project from advanced exploration and mine development up to commercial production. Cantex reported favorable drilling results that extended the identified area of gold mineralization at the Al Hariqah gold project in October 2013, and WCP decided to become a partner in the project in February 2014. The Al Hariqah gold deposit is located 130 km northwest of Sana'a (Cantex Mine Development Corp., 2013b, 2014; Yemen Geological Survey and Mineral Resources Board, 2014d).

Lead and Zinc.—The Jabali zinc and silver mine site had remained idle for the past 4 years as the owner, Jabal Salab, sought replacement financing for the project. Jabal Salab was jointly owned by ZincOx Resources p.l.c. (52% interest) and Ansan (48%). The Jabali Mine, which is located near Nehim about 110 km northeast of Sana'a, was the first large-scale metal mine planned in Yemen. The deposit was estimated to contain 12.6 Mt of oxide resource grading 8.9% zinc, 1.16% lead, and 69 grams per metric ton (g/t) silver, of which reserves were estimated to be 8.7 Mt grading 9.2% zinc at a cutoff grade of 4.4%. In March, ZincOx sold its interest in Jabal Salab to its joint-venture partner Ansan, which made Ansan the sole owner of the project (ZincOx Resources p.l.c., 2013; Yemen Geological Survey and Mineral Resources Board, 2014d).

Niobium and Tantalum.—Ansan held two mining permits in the Nisab and the Mujab properties, which are located in Shabwah Province in southern Yemen. Earlier geochemical analyses from differentiated pegmatite samples indicated the presence of lithium, niobium, tantalum (0.006% to 0.04%), and tin (more than 0.05%). Ansan estimated the mineral resources of contained niobium oxide and rare-earth oxides to be 30,000 to 40,000 t each. The company measured concentrations between 0.01% and 0.13% niobium and between 0.005% and 0.01% tantalum at the Nisab site, and between 0.02% and 0.05% tantalum and between 0.01% and 0.02% niobium at the Mujab site (Arab Industrial Development and Mining Organization, 2012).

Industrial Minerals

In 2013, the YGSMRB conducted a survey of mining activities in Sana'a and Thammar Provinces. The results of the survey indicated that there were 819 active mining operations in the two Provinces. These operations produced 2 Mt of building materials and 1,000 t of unspecified industrial minerals in 2013 (Abdulmageed, 2014, p. 261).

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Cement.—Cement production was estimated to have increased to 3.0 Mt in 2013 from 2.8 Mt in 2011 and 2012. Cement production in Yemen peaked at 3.6 Mt in 2010 after the completion of the country's sixth cement plant, although, in spite of the peak production, the country reported importing 755,000 t of cement in that year. Cement production decreased to 2.8 Mt in 2011 because of high energy costs and political unrest, which caused production to stop at three of the country's cement plants. State-owned cement plants (Al Burh Cement Factory, Amran Cement Factory, and Bajil Cement Factory) produced about 1.1 Mt of cement in 2013 compared with 951,000 t in 2012. In 2013, the YGSMRB received applications and proposals to build new cement plants in Al Hudaydah and Hadramawt Provinces (Al Razhi, 2014, p. 469; National Information Center, 2014, p. 10).

Iron Oxide Pigments and Titanium.—Nine sites had been identified by the YGSMRB as potential locations for mining of iron oxide pigments and titanium in Yemen. The YGSMRB awarded a permit to Yemen Iron Steel Co. to explore for iron oxide in the Thanyiah property, which is located in Ma'rib Province. Shabbir Metals Co. was exploring in the Sabah site (Al Bayda Province) and reported 2 Mt of iron ore reserves grading betwen 35% and 55% iron. YGSMRB also reported the presence of iron ore and titanium deposits in the Mkiras region (Al Bayda Province), which together contained an estimated reserve of 860 Mt grading 15.6% iron, 5.3% titanium, 3.14% phosphorus, and 0.02% vanadium. The National Cement Co. held a permit to explore for iron oxide pigments at the Um Halwal (Majil) property in Abyan Province. Estimates for resources at this site were 46,000 metric tons (t) grading 68% iron oxide (Arab Industrial Development and Mining Organization, 2012, p. 108; Yemen Geological Survey and Mineral Resources Board, 2014d).

Mineral Fuels

Petroleum.—In 2013, Yemen had 105 concession blocks, of which 13 were in production and operated by 11 oil companies and 26 were being explored by 14 oil companies. In March, the MOM conducted a bidding round for oil and gas exploration and production on 20 of its 66 open blocks (offshore and onshore). The MOM qualified the following nine international oil companies: Circle Oil p.l.c. of Ireland, DNO Yemen (a subsidy of DNO International A.S.A) of Norway, Geopetrol International Holding of Panama, Guney Yildizi Petroleum of Turkey, Heritage Oil p.l.c. of the United Kingdom, Hunt Oil Co. of the United States, Kuwait Foreign Petroleum Exploration Co. (KFPEC), Pakistan Oil Fields Ltd., and STR Holding Co. of Brazil. In June, the MOM approved a production-sharing agreement for DNO on Block 84 and KFPEC on Block 102. On Block 84, DNO would be the operator and hold a 59.5% interest; Dogan Enerji Yatirimlari Sanayi ve Ticaret A.S. of Turkey would hold a 25.5% interest; and Yemen General Corporation for Oil and Gas, a 15% interest (table 2; Petroleum Exploration and Production Authority, 2014).

In October, DNO conducted tests for crude oil production at the Salsala 1 exploration well in Block 32. The well produced 5,900 bbl/d of crude oil during the testing phase. DNO was the operator of Block 32 and held a 38.95% interest in the production-sharing agreement. DNO was also the operator for Blocks 43 and 47, and it had a 24.25% interest in Block 53, which was operated by Dove Energy Ltd. of the United Kingdom, and an 18% interest in Block 72, which was operated by Total S.A. of France (table 2; DNO International A.S.A., 2014).

Kuwait Energy Co. had interests in six crude oil blocks in Yemen, two of which (Blocks 5 and 43) were in production. The company reported a 287% increase in production from Block 5, which was operated by the company, to 4,718 bbl/d of crude oil in 2013 from 1,219 bbl/d in 2012. The increase was attributed to a full year of production in 2013 compared with 113 days of production in 2012. Kuwait Energy also had equity in Blocks 35, 49, 82, and 83, which were at the exploration stage of development during 2013 (Kuwait Energy Co., 2014, p. 16).

Outlook

The approval of the Mines and Quarries Law by the Parliament of Yemen and the gradual return to political stability and security to the country at the end of a 2-year political transition period in early 2014 had been thought likely to bring back some of the foreign investment that had left the country in recent years. The political unrest and military conflict that engulfed the country in the second half of 2014, however, diminished those prospects for the near future. Foreign investment has been cited as necessary for the construction of such projects as an industrial city, an industrial minerals export port, a railway, and a vocational training center. The Jabal Salab zinc project, which would be the country's first large-scale metal mining operation, is another example of a project for which the Government was seeking foreign investment. The development of the mineral industry in Yemen could help reduce the unemployment rate in the country, which exceeds 50%.

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TABLE 1
YEMEN: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		2009	2010	2011	2012	2013
INDUSTRIAL MINERALS						
Cement		2,118	3,600 r	2,800 r	2,800 r	3,000
Gypsum[e]		200 [3]	200	100	100	100
Salt[e]		79 [3]	75	75	75	75
Sand and gravel[e]		12,360 [3]	12,500	6,000	6,000	6,000
Stone:[e]						
Basalt		899 [3]	900	500	500	500
Granite		220 [3]	220	100	100	100
Limestone		5,900 [3]	6,000	3,000	3,000	3,000
Marble		690 [3]	250	250	250	250
Volcanic tuff		2,657 [3]	2,700	1,400	1,400	1,400
MINERAL FUELS AND RELATED MATERIALS						
Natural gas:						
Gross	million cubic meters	29,600	29,200	29,600	29,600	30,000 e
Marketed	do.	800	6,200	9,400 r	7,600 [3]	10,300 [3]
Petroleum:						
Crude, including condensate	do.	111,690	106,125	83,220	65,700	58,765
Refinery products:						
Liquefied petroleum gas	do.	8,526 r	8,538 r	6,786 r	7,772 r	9,245
Naphtha	do.	488 r	761 r	1,861 r	2,704 r	6,054
Gasoline	do.	8,991 r	8,052 r	3,736 r	1,092 r	1,552
Kerosene	do.	4,121 r	3,633 r	1,956 r	1,252 r	3,262
Distillate fuel oil	do.	7,982 r	8,176 r	5,684 r	2,651 r	6,430
Residual fuel oil	do.	4,595 r	3,976 r	3,263 r	1,379 r	4,296
Asphalt	do.	564	594 r	145 r	79 r	145
Total	do.	35,267 r	33,730 r	23,431 r	16,929 r	30,984

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto.
[1]Table includes data available through February 9, 2015.
[2]In addition to the commodities listed, aggregate, clays, feldspar, mica, rolled-steel bars, silica sand, scoria, talc, and zeolites may have been produced, but available information is inadequate to make reliable estimates of output.
[3]Reported figure.

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TABLE 2
YEMEN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[e]
Basalt		Local private companies	Hadramawa, Sana'a, Ta'izz, Dhamar	900
Cement		Amran Cement Factory [Yemen Corporation for Cement Industry and Marketing (YCC), 100%]	Kilns and mills at Amran	1,500
Do.		Al Burh Cement Factory [Yemen Corporation for Cement Industry and Marketing (YCC), 100%]	Kilns and mills at Mafraq	800
Do.		Bajil Cement Factory [Yemen Corporation for Cement Industry and Marketing (YCC), 100%]	Kilns and mills at Bajil near Ta'izz	500
Do.		National Cement Co. (Hayel Saeed Anam & Co. Ltd., 100%)	Kilns and mills at Wadi Saim, Lahj	1,600
Do.		Arabian Yement Cement Co. Ltd. (Eastern Province Cement Co., 30%; Al-Amoudi Group, 15%; Bagshan Group, 15%; Saudi Binladin Group, 10%; Baroom Investment Holding Co. Ltd., 10%; Ali Ali Hussain Miksa, 10%; Sara Development Co. Ltd., 5%; Yemeni Group for Development of Yemen, 5%)	Kilns and mills at Al-Oyoun, Hadramawt	1,500
Clays		Local private companies	Al Hudaydah, Lahij, Ibb, Hijjah, Al Jawf, Ma'rib, Samaa, Shabwah, Ta'izz	700
Gypsum		do.	Al Hudaydah, Hadramawt, Sana'a, Shabwah	200
Limestone		do.	Amran, Hadramawt, Sana'a, Ta'izz	4,000
Do.		3S Minerals Pvt. Ltd	Hadramawt	1,000
Do.		Naine Minerals and Resources Pte. Ltd.	Hadramawt, Yathmoon	1,000
Marble		do.	Hijjah, Ma'rib, Ta'izz	700
Natural gas:				
Associated	million cubic meters	Jannah Hunt Oil Co. (Yemen General Corporation for Oil and Gas, 71%, and Hunt Oil Co., 29%)	Jannah field (Block 5)	227
Liquefied	thousand metric tons	Yemen LNG Co. (Total E&P Yemen, 39.62%; Hunt Oil Co., 17.22%; Yemen Gas Co., 16.73%; SK Energy, 9.55%; Korea Gas Corp., 6.00%; Hyundai Corp., 5.88%; Yemen General Authority for Social Security and Pensions, 5.00%)	Ma'rib field (Block 18), LNG plant in Belhaf	6,700
Petroleum:				
Crude	thousand 42-gallon barrels	Occidental Petroleum Yemen (Occidental Petroleum Corp., 65%, and Yemen General Corporation for Oil and Gas, 35%)	Damis field (Block S1)	4,000
Do.	do.	OMV A.G., 68%, and Yemen General Corporation for Oil and Gas, 32%	Al-Uqla field (Block S2)	1,560
Do.	do.	Calvalley Petroleum Ltd., 59%, and Yemen General Corporation for Oil and Gas, 41%	Malik field (Block 9)	2,000
Do.	do.	DNO Yemen (Yemen General Corporation for Oil and Gas, 52%, and DNO International ASA, 48%)	Hwarim field (Block 32)	3,300
Do.	do.	DNO Yemen (DNO International ASA, 62%, and Yemen General Corporation for Oil and Gas, 38%)	South Hwarim field (Block 43)	2,600
Do.	do.	Yemen General Corporation for Oil and Gas, 51%, and Dove Energy Ltd., 49%	East Saar field (Block 53)	4,000
Do.	do.	Jannah Hunt Oil Co. (Yemen General Corporation for Oil and Gas, 71%, and Hunt Oil Co., 29%)	Jannah field (Block 5)	15,700
Do.	do.	Korea National Oil Co. (KNOC), 82%, and Yemen General Corporation for Oil and Gas, 18%	West Ayad field (Block 4)	123
Do.	do.	Total E&P Yemen (Yemen General Corporation for Oil and Gas, 59%, and Total S.A., 41%)	East Shabwah field (Block 10)	13,700
Do.	do.	Safer E&P Operations Co. (Government, 100%)	Ma'rib field (Block 18)	22,000
Do.	do.	Canadian Nexen Yemen Ltd. (Nexen Inc., 63%, and Yemen General Corporation for Oil and Gas, 37%)	East Al-Hajr oilfield (Block 51)	5,500
Do.	do.	Masila Petroleum Exploration and Production Co. (PetroMasila)	Masila field (Block 14)	42,000

See footnotes at end of table.

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TABLE 2–Continued
YEMEN: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[c]
Petroleum—Continued:				
Refined	thousand 42-gallon barrels	Aden Refinery Co. (Government, 100%)	Refinery at Aden	150
Do.	do.	Yemen Oil Refining Co. (Yemen Hunt Oil Co. and Exxon Yemen, Inc., 75.5%, and Yukong Group, 24.5%)	Topping plant at Ma'rib	140
Pumice		Local private companies	Dhamar	2,500
Salt:				
Crude:				
Marine		Local private companies	Eleven saltworks near Aden	150
Rock		do.	Five salt mines near Salif	140
Refined		Salt Refining and Packing Factory (Government)	Salif	50
Do.		Aden Salt Factory (Government)	Aden	150
Scoria		Local private companies	Dhamar, Ma'rib, Shabwah	500
Steel, finished products		Arab Iron and Steel Corp.	do.	100
Do.		Mukalla Iron and Steel Co.	Rayan	500
Do.		Yemen Steel Manufacturing Company Ltd. (Al-Rhabi Trading Group, 100%)	Al Hudaydah	500
Stone		About 1,900 local private companies	Dhamar, Mayana, Sana'a, Ta'izz, and Wadi Marek	16,000

[c]Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto.

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